MOTOR AGE

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CONTENTS

Evidence of Price Stabilization at Chicago Show 7
By Clyde Jennings

Graham Speech Closes Salesmen's Training School Preparatory to Opening of Chicago Show 10

Accessories Shown at Chicago Mostly Those Which Add Convenience and Efficiency to Cars 12

Several Car Makers Spring Surprises at Chicago Show 14

Detroit Sales Pass 1921 Mark 17

Trends in Motor Car Development 18

Cars Improved for the Service Man 20

More Miles Per Gallon 26

Design in Power Plants Improved 31

Things That Make the Car Stand Up 42

Making the Owner More at Home 51

Foolproofing the Electrical System 58

Motor Age Passenger Car Serial Numbers 64

Buyers' Guide to 1922 Cars 72

Mechanical Specifications of 1922 Passenger Cars 76

Detailed Specifications of 1922 Motorcycles 80

Specifications of 1922 Farm Lighting Plants 81

Specifications of Electrical Equipment Found on 1922 Passenger Cars 82

Mechanical Specifications of 1922 Motor Trucks 86

Detailed Specifications of 1922 Farm Tractors 92

Buyers' Guide to Tractors 95

10,449,785 Cars and Trucks Registered in 1921 96

Editorials 98

News of the Industry ..... 100 to 112

The Readers' Clearing House 113

Coming Motor Events 118

Index to Advertisers Next to Last Page.

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MONROE
Self-Oiling
TIRE PUMP

Dependable

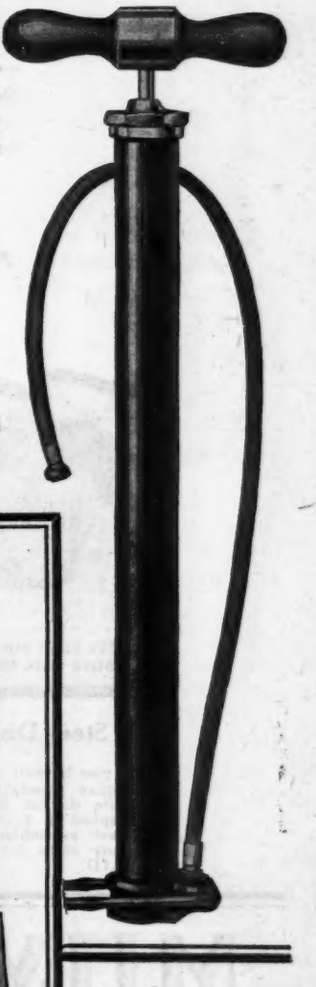
—because it never dries out

Sells Fast

—because it is low in price

Sell YOUR customers a MONROE if you want to give them pump satisfaction. Most pumps that go into cars today, however fancy and ornamental they may be, soon become dried out and useless. Not so the MONROE. The patented, self-oiling MONROE washer keeps this pump ready to deliver a full head of air INSTANTLY. Whether it lies in the tool box a month or a year, it is all set for action the moment it is needed. Because of this complete dependability—and the low selling price—the MONROE has the preference everywhere. If you're not already SELLING the MONROE, write for details and prices.

Just Ask 'em—
They'll Buy
the MONROE



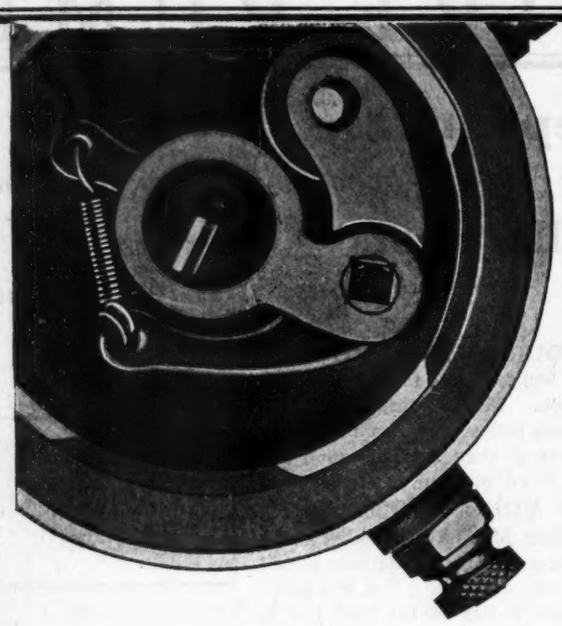
Monroe Auto Equipment Mfg. Company

Monroe - Michigan

The Fulton Company
Milwaukee
Sales Representative

Makers also of Monroe Brake Shoes for Fords and Monroe Closed Car Spotlight Brackets.

Growing Bigger Every Day



Timer Business becoming one of the livest money-makers in the Accessory Trade

Recent investigation showed that replacement timers for Fords are one of the three fastest selling lines in most auto supply stores and garages.

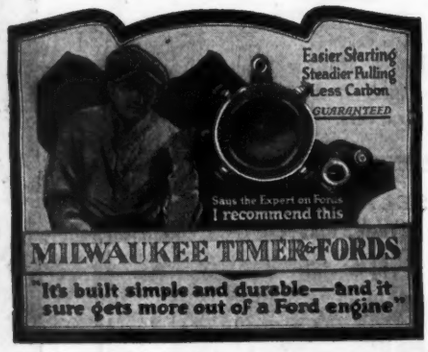
Also, that by far the largest part of this profitable timer business has been built up in the last two or three years. It has been a case of educating Ford owners on **timers**—selling them better ignition—easier starting, steadier pulling, more power, less carbon. Part of this educating has been done by progressive dealers—much of it by the timer manufacturer.

Why the MILWAUKEE Dominates

The **Milwaukee** has always been the best-known, best-advertised replacement timer. In 1921, the money spent to increase the demand for **Milwaukee Timers** was far greater than that spent by any other timer manufacturer. This year the **Milwaukee** is being advertised even more extensively than ever before.

As a result, the **Milwaukee Timer** is a known value to Ford owners. They know it is good, dependable and durable. They don't have to be "sold" by the dealer—they come to the store to **buy** a **Milwaukee.**

Think this over, Mr. Dealer. Which manufacturer is doing the most for you—the one who sends the Ford owner to your store to **buy** a timer—or the ones who just make a timer and let **you** do all the selling?


Easier Starting
Steadier Pulling
Less Carbon
GUARANTEED
Says the Expert on Fords
I recommend this
MILWAUKEE TIMER for FORDS
"It's built simple and durable—and it sure gets more out of a Ford engine"

Steel Display Stand—FREE

If you haven't one of these Milwaukee Timer display stands for your window or counter, write us for one today. Handsomely lithographed in 5 colors. Holds actual timer and brush assembly. Won't tip over. Will make many sales for you. Sent FREE—POSTPAID.

It pays to tie up to Milwaukee Timer advertising by using window and counter displays. If your stock of Milwaukee Timers is low, re-order from your jobber. Spring will soon be here—and that means more timer sales, you know.

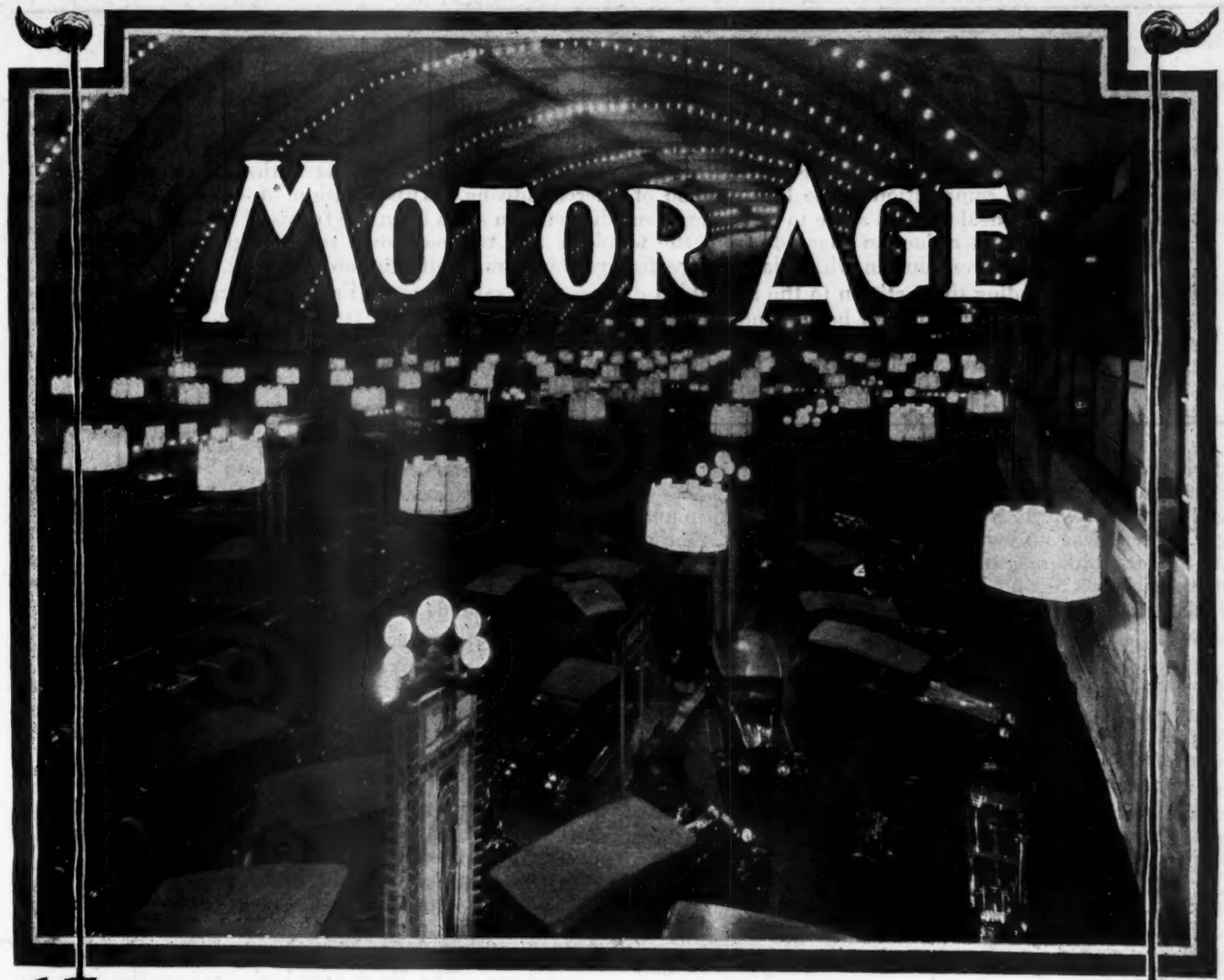
Milwaukee Motor Products, Inc.

(Formerly Milwaukee Auto Engine & Supply Co.)

Milwaukee, Wisconsin

MILWAUKEE TIMER for FORDS

Vol. XLI, No. 5 FEBRUARY 2, 1922 $3 Per Year



Myriads of lights flood Coliseum at 22nd Annual Automobile Show

Evidence of Price Stabilization at the Chicago Show

HYSTERIA over money value gives way to quality talk as 1000 trained salesmen meet the public that throngs Coliseum. Show is bright, cheerful and friendly. Moon exhibits new chassis and Hudson and Nash have low priced closed jobs. Columbia shows new car in hotel.

By CLYDE JENNINGS

THE Twenty-second Annual Chicago Automobile Show was opened in a manner satisfactory to those most concerned. There was a very good first day attendance and the Coliseum and other buildings which house the exhibits were ready. The decorating scheme was well worked out and it was probably the lightest and brightest show ever staged by S. A. Miles, who manages the show on behalf of the National Automobile Chamber of Commerce.

A hasty review of the show was convincing that the manufacturers and others who decide upon the policy to be followed in connection with the exhibition had

Soft Pedal on Price Advertising

LATE in the week previous to the Chicago show a petition was circulated among Chicago dealers in which the signers addressed each other in a plea that "no undue emphasis" be placed on price advertising during the show or until July 1, 1922.

The plan is to demonstrate that selling cars by quality of the product rather than by direct price competition is the best method of merchandising. This petition, if heeded by the various dealers, will serve to remove the muslin bargain signs from the fronts of the building, the "great reduction placards from the windows and to tone down some of the recent newspaper advertising in which large price figures were practically the only feature.

In reading this petition to the assembled dealers and salesmen on Friday night, Henry Paulman said that it had been signed by 44 dealers. His expectation, from the response of those approached, was that 100 per cent of dealer signatures would be obtained. The lack of signatures was chiefly due to a lack of time for the man to cover the entire field in the short period of work before the show.

decided to profit by the mistakes of the New York Show, which were apparent to everyone and were so well put into words by S. A. Miles, the veteran manager. There was no evidence of a price hysteria, neither in the exhibits nor in the advertising. A very few new prices were announced and one of these was by Jackson, which was not an exhibitor at the previous shows.

The special editions of the afternoon and the Sunday morning papers were evidence that the powers that be were quite willing to drop money values as a sole bait to the public. Only three or four of the ads featured prices in a way that would indicate lower values. In some cases, these advertisements were misleading, as the prices were the same as those announced early in the year, but the impression sought was that they were new prices. Only one advertisement had any of the ugly text that talked of "cheapening the car to meet price competition."

There was very little talk around the show as to what the Dodge prices would be and it appeared that this sensation of previous gatherings had to a large extent shot its bolt. If any of the competing dealers were worried about what was to happen on Feb. 1, they concealed this anxiety.

The small number of factory executives present was rather a contrast with the early days of the New York show, and was regarded as a very good sign by the observers. At New York there was a great deal of anxiety as to what the show was going to indicate in the way of public interest in both attendance and buying. It was pretty generally accepted after that show that the public was interested and that there would be some buying. This appears to be taken as a matter of course for the Chicago show.

Outlook for Sales Cheers Dealers

There is a great deal of interest in these early days as to how much buying interest will develop. The dealers were rather enthusiastic after the first few sessions over the prospect for sales. They said that their inquiries indicated that a good many of the visitors were really interested in new cars and that their prospects were bright.

Locally, and to a considerable extent with the factory men, the chief interest in the show was as to how the plan of the Chicago Auto Trades Association in the special training of salesmen for the show work will result. It was evident from the first conversation with a salesman that they held a different attitude toward the public than those at the New York show. There was no embarassment in a conversation, as the men had been given basic information on which to talk with the visitors, and all were very courteous in directing inquirers to other exhibits. Questions as to the industry and as to price tendencies were quickly and positively answered.

There were few surprises in the way of new cars. The chief of the new creations was not at the show, but in the La Salle Hotel writing room, here the Columbia Motors Co. exhibited a new six to sell at $985. Those who saw it were quite interested in the prospect of this car, frankly an assembled prospect and proud of it, coming into production in May. It is said that the production of this car will be based on the excellence of the parts and the fact that it is assembled from the highest quality of parts makers' products.

In the show were the Hudson coach and the Nash carriole, new closed jobs which reduce the spread between the touring car and the closed car. The Hudson was priced at $1795, which is only $100 more than the touring car. The Nash new body was on the four cylinder chassis and was priced at $1395, or $305 more than the touring car. These bodies attracted much attention.

Attendance Indicates High Interest of Public

The only new chassis at the show was the Moon, which was the expected six-cylinder job and was priced at $1295.

In appearance the show made an excellent impression. The decorations were light in color and there appeared to be more color in the body displays than at the New York show.

Thomas J. Hay, president of the Chicago Auto Trades Association, was looking over the show from this vantage point when he offered this comment:

"The show looks excellent and the number of visitors indicates that we are going to have a very high attendance. All of this indicates that the public interest in the automobile is greater than ever. The interest grows with the number of vehicles in use, which proportionately indicates the great number interested each year.

"The fact that the automobile is developing is apparent to every one who comes into contact with the vehicle. The transportation that it supplies quickly becomes so vital to those who use it that every car owner is looking forward to improvements that mean something. Then, too, the appearance has a strong hold on many persons.

First regiment armory houses many splendid exhibits at Chicago show

"I think that here in Chicago we have created the right atmosphere for the show and we will be able to strengthen that impression through our properly trained salesmen during the show. It is a fact that every dealer in Chicago who has an improved car is having many inquiries this year that are entirely unsolicited. It is a fact that where the dealer knows some weaknesses of his car and the factory does not make an effort to correct these weaknesses, the dealer loses heart. I believe that the position of the dealer is stronger than ever before and that the position of the honest speaking, intelligent dealer will continue to improve. It is good to stand here and look over the displays and recall the efforts the factories have been making in each of them to better serve the owners. This gives the dealer heart to work."

Steam Car Made in 1899 Exhibited

There were, of course, chief points of interest. The 1899 steam Locomobile was one of these. This car belongs to John Barr, of Dayton, Ohio, and has been used each year. It carried a 1921 license. This car was brought to the show by the management as the oldest car that could be found manufactured by one of the present exhibitors. It was driven by Barney Oldfield up Wabash avenue on Friday as a feature of the opening of the show. Few visitors did not stop to look at this car.

The Stanley steamer was, as usual, always surrounded by a crowd listening to the lecturer. The cut-out chassis always had more of a crowd about them than the finished cars.

One could not escape noting the willingness of salesmen to open the car doors or lift the hoods for any person who inquired. The sale of ribbons to warn people from opening doors or lifting hoods was at a minimum for this show. Any visitor was welcome to sit in the best car in the show.

Coincident with the Automobile show is the Automobile salon which is nicely staged in the Drake Hotel. This exhibition opened at the same time as the automobile show, and while there was not the rush for admission, by evening there was a very satisfactory attendance, with every indication of an entirely satisfactory week. There is an unusual run of new bodies displayed, most of which are custom built. The Davis car showed a chassis with a new six-cylinder engine.

The hotel displays are practically the same as those at New York except the Columbia job previously mentioned. The chief difference is that the Leach-Biltwell cars are in the Congress Hotel instead of in the show, as in New York. The Rickenbacker has only a chassis in the show by courtesy of the Chamber members and a rather liberal display of cars in the hotels. The Kissel is rather strong on hotel displays.

More Dealer Meetings Being Planned

The Gray, still priced "under $500," has hotel space for a chassis and a touring car, while the Fox air-cooled is again displayed.

The usual interest is shown in the accessories and equipment displayed on the balconies. There is a greater display of shop equipment than in previous years.

An increasing number of dealer meetings are being announced. Notable among these events were the Franklin luncheon for the showing of the new air-cooled car to western dealers and the showing of the Jewett to Paige dealers in the salesrooms in Chicago.

Graham Speech Closes Salesmen's Training School
Preparatory to Opening of Chicago Show

Chicago, Jan. 27.

THE most remarkable meeting held by the Chicago Auto Trade Association was that at the Congress last night, which was the climax of the campaign to train dealers and salesmen for a proper presentation of the automotive industry at the twenty-second annual Chicago Automobile Show.

In numbers, the dinner was not as large as that of 1921. The latter function was planned as a dinner to the industry, this one was for the Chicago dealers and their staffs only, and more than 1,000 were present.

George Graham, vice president of the Chandler Motor Car Co., was the chief speaker, and his effort was to show to those present the great need of standing for the industry upon which they were depending for a living, and which carried the hopes for their future, for themselves and their families.

He said that the day had come when it was necessary to do more than sell a car, but build a business that would last for the future. During the more or less troubled times of 1921 he said that both the manufacturer and the dealer had learned much and there should be a great hope for co-operation, and there was reason for a belief that co-operation would be established which would work out to mutual benefit.

Thomas J. Hay, president of the Chicago Auto Trade Association, presided at the meeting. The first speaker was Henry Paulman, who explained the origin of the thought to train the salesmen and other representatives at the show in a coming line of conversation with visitors. This thought had occurred to the Chicago men even before the New York show, and their course of work was finally outlined by members of the trade association who composed the party going to New York. During the show in New York they were greatly impressed with the varied stories told by the representatives to the public and by the price hysteria.

Prize for Best Answers

In addition to the questions and answers, which have been printed in MOTOR AGE, the committee prepared a data sheet which contained the figures of the industry which must be used in conversation. Much attention had been given to this meeting by all sales managers who entered into the plan quite enthusiastically. A special effort had been made to convince the salesmen and others that these questions and answers were not to be learned as a catechism, but they were simply a guide for the information that was to be given out.

As a further stimulation in this work a prize of $50 had been offered for each day of the show and a stranger would be sent around to interview the men in the various exhibits and he would decide as to who told him the best story about the industry. The prize awards will be announced each morning for the day before.

S. A. Miles, manager of the New York and Chicago shows, talked briefly on the wonderful spirit of co-operation he had found in Chicago and his extreme pleasure in learning that the effort to coordinate the contact with the public.

Keynote Motto For Season of 1922

THE results of twenty years' experience of engineering and business executives of the highest class are reflected in the design, material, workmanship and prices of the cars of 1922.

Miles was quite a severe critic of the conduct of the salesmen at the New York show and the general excitement on the price situation.

Commends Chicago Effort

He commended the Chicago effort very warmly and brought out the fact that the show was given, not to sell a few cars to prospects who might gather, but to sell the industry to the people and to the men within the industry. He said that the two great national shows supplied a meeting place where the men from within the industry and from all points of the world gathered to exchange ideas for the benefit of all.

Harry Moock, general manager of the National Automobile Dealers' Assn., was introduced and spoke briefly on the prospects for the year of 1922. He said that he believed this year would be one of elimination of men who did not study their work and who did not get down to hard work. He referred to the recent clamor, during the singing, of a large group for the "Wisconsin" song. He said that he believed if the men who had called for this song and those who had joined in the singing, would adopt the last two lines of the song as their slogan for 1922 that all would be well with them. The two lines referred to were:

"Fight, fellows, fight,
And we will win the game."

Graham began his address with his plea for co-operation. He said that during the fat years of 1919 and early 1920 dealers everywhere had fought for cars. They had demanded them and pleaded for them, and then came the latter part of 1921 and the manufacturer was then keyed up to a very high production. He was reluctant to cut down his manufacturing schedule very quickly and he forced some cars on the dealers.

Graham said that he believed that during the lessons of the last year had been sufficient to cure this tendency, and he did not believe that ever again that dealers would be so loud in the demands on the factories and he did not believe that the factories would force so many cars on the dealer. This, he said, was one of the big blessings that would make for co-operation between the dealer and the factory.

Manufacturers' Co-operation

Much amusement was created when Graham referred to the very close co-operation that he had found between the manufacturers. He cited as example the fellowship between the Hudson and Essex; the Chandler and the Cleveland, and the Paige welcome of the new Jewett car. He said that aside from the example picked at random he seldom found that manufacturers were in full accord, but he hopes that in the near future they would realize the need of co-operation and good fellowship for the benefit of the industry, but that he believed the dealers were much nearer co-operation than the manufacturers and that the Chicago Auto Trade Association was a shining example of what co-operation could accomplish.

There are five problems that the dealer must solve for himself to insure his future, according to Graham. These five, briefly stated, are:

1. Am I in the right business?
2. Is an overproduction of vehicles possible?
3. Will prices finally stabilize?
4. Can I finance my business?
5. The used car problem.

Graham disposed of each of these problems briefly, saying enough to indicate his thought. As to whether the dealer was in the right business or not, he said that only the man himself could answer

this question. If he liked the business and liked the people he was in the right business, because he could easily convince himself that an automotive dealer was selling transportation and that transportation is one of the five essentials. Usually transportation comes after food, fuel, shelter and raw materials. He called attention to the importance of over-production Graham said he did not believe that this would ever again take place. That the lessons of 1921 had been very severe and that many manufacturers in shipping unordered cars to dealers had found that the dealer did not present himself at the railroad station with a draft to take up the bill of lading and that these were left on the manufacturer's hands and the storage bills were very heavy. He said he felt that the day of co-operation was at hand.

Prices Based on Large Production

Considering the question of stabilization of prices, Graham called attention to the recent Ford cut, and he said he believed this would go far to convince the public that the period of price cutting was at an end. He said that the present prices were based on an expectation of a large production which would cut the overhead. If large sales did not follow, he believed that price advances soon would be in order.

On the question of financing the dealer business, he said that this was largely a question of how frankly the merchant of the automotive vehicle discusses his business with the merchant in money, otherwise known as the banker. He said that confidences must be exchanged and that a good will should be established and that any dealer should be able to sell his transportation project to the bankers.

On the question of used cars, Graham said that the department store methods were the great needs of the motor car dealer today. First that the dealer must convince himself that just as the manufacturers have had to reduce their prices on new vehicles, so must the owner of the present used car reduce the price on his vehicle. The present owner of used cars must liquidate their present merchandise and that the dealer must not buy the used car of today on the price established before the adjustment was made on the new car.

The Salesman's Job

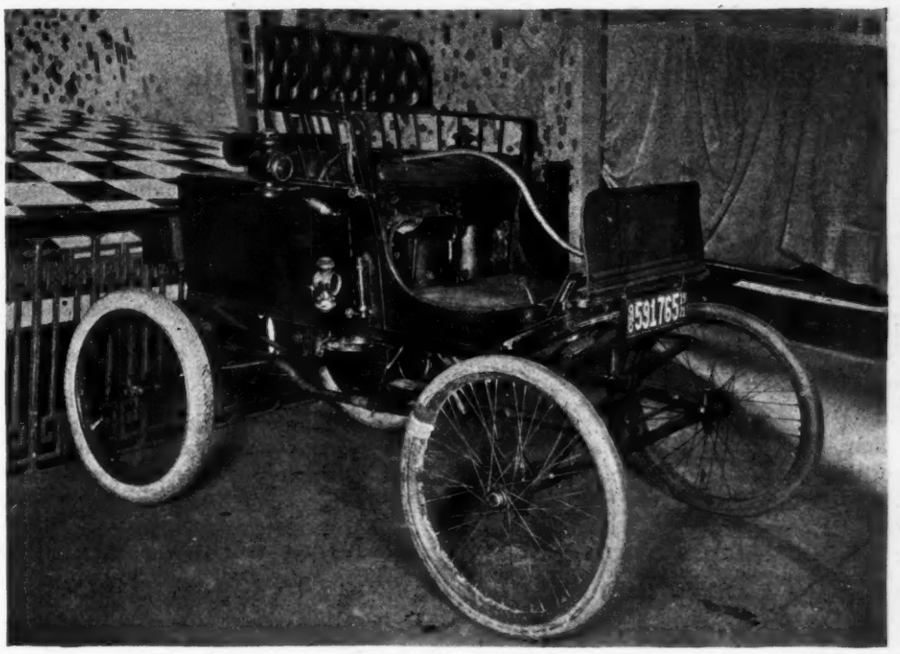
The automobile salesman of today must not sit around and wait for somebody to come in and confer a favor on the establishment by buying a new car, but this salesman must come down in the morning with the sole purpose of bringing some money into the dealer establishment. He must recall thoroughly that he has a complete line of goods; that his line is selling the latest models; the next latest models, it should be a very good car; the reduced car; the as-is car; the lower-priced trade-ins.

He said that the men with this line of goods should find out how much money the prospect has and adjust himself to this amount of money and sell the man the best car that the man was capable of buying. As a slogan for the coming year Graham suggested the following:

"The quickest way to forget the losses of 1921 is to collect the profits of 1922."

A tribute to business as the world power and the force that not only regulates governments and business affairs, but provides for the families and the human touch closed Graham's address.

Officials and salesmen of the Chicago branch of the Cadillac Motor Car Co. opened their show activities Thursday evening at a meeting and banquet in the Blackstone hotel, Chicago. Expectation of excellent business during the show and following it were expressed by the speakers. About 50 attended the dinner. This meeting was followed by a sales meeting Jan. 27, at which William Holmes, technical expert from the factory, gave a chassis lecture to salesmen and dealers.



Locomobile of Ancient Type

WHILE the various makers in the industry are showing their most recent product at the Chicago show there is one car, while it may not be in accordance with the last word in design or body construction is interesting nevertheless because it represents the winner in the old car contest of the show. It is a steam driven Locomobile built in 1899 and is still running under its own power. The car is owned by John Barr, of Dayton, Ohio.

This old timer is built with buggy type springs supporting a body quite unlike that of anything else at the show. Even the steering wheel is missing and in its place there is a lever. The steam engine is mounted directly under the seat and drives a tubular rear axle by means of a roller chain. The wheels are about the size of those used on a motorcycle.

The control levers for the throttle, etc., are placed at the right of the driver and a small pedal about the size of the conventional accelerator pedal on today's cars controls the brake. Two pressure gages constitute the dash equipment.

Dealers' Meetings for the Week

SHOW week in Chicago will witness the holding of many dealer meetings of importance. The new $1,000 Franklin air-cooled car will be shown to dealers in the mid-west district at a meeting in the Congress at Wednesday noon.

President H. M. Jewett of the Paige-Detroit Motor Car Co. will present to his dealers the new Jewett car at a meeting Thursday evening at the Blackstone. This is the light six which will sell in the $1,000 class.

Velie dealers will meet at the Drake Wednesday, when the new engine and car models will be shown. The mechanical improvements will be carefully detailed as important to developing volume business.

Jordan dealers will be addressed by President Edward S. Jordan and General Sales Manager W. B. Riley at a meeting

Thursday noon at the University club.

The new Chandler line will be presented to the dealers of the mid-west territory at a luncheon meeting Tuesday noon at the Congress.

The Overland dealers' meeting will be staged at noon Wednesday in the Congress, with President John N. Willys, Vice President Walter P. Chrysler and Sales Manager A. C. Barber slated to address the gathering. As in New York, the factory organization will be presented to dealers with a view to establishing closer contacts and co-operation.

The Oldsmobile dinner will be staged at the Congress Wednesday at 7 p. m., at which President A. B. C. Hardy and a number of General Motors executives will make addresses.

Sales and advertising men are prominent at the show, and will put in a busy week. Some of them are actively at work in some of the exhibits directing sales efforts, but for the most part they will devote their effort to strengthening the dealer organizations in the territory. The movement toward exclusive dealerships looms up more strongly with the introduction of the lighter models, and many realignments of territory are in the making.

Production on Increasing Scale

PRODUCTION is stepping up at the factories as the show season progresses. Reports of factory representatives at the Chicago show indicate buying responses at the January shows exceeding expectations of dealers and manufacturers alike and holding out promise of a steady improvement in the automotive situation.

Many of the factory men report their dealers as having devoted a large part of the last few months toward clearing out the bulk of their used car stocks in preparation for active sales campaign. Now with their used cars down to a working level, the dealers are putting additional impetus behind their show efforts and this is bringing the actual sales high.

Responses to the appeal of new models offered by some of the smaller producing companies indicate that the public has not yet bound itself to confine its buying to certain large producing lines. One of these is said to be sold several months ahead as a result of orders placed at the January shows, and several others report themselves as rushed to meet delivery demands.

Addition of units are reported planned by at least one company, which is now at capacity and finds itself nearing the point where it will have to increase its facilities.

Accessories Shown at Chicago Mostly Those Which Add Convenience and Efficiency to Cars. Better Shop Equipment Shown

IF NOT a survival of the fittest, the Accessory Show for this year could at least be called an elimination of the unessential in equipment and shop-fitments and those articles used to secure convenience and efficiency for the car owner.

The exhibition was marked by the absence of the usual sensational and wild-cat type of accessory and it was evident that the accessory manufacturers have given a thought to quality both in the finish and design of products offered. The crowds viewing these exhibits displayed a genuine interest in those certain articles which form a part of their daily life. Curiosity seekers were in the minority and where one or more people gathered about any of the booths it was from the standpoint of genuine interest in the article on exhibition.

Garage owners and service executives were present to examine and compare the various labor saving devices that were offered, a well defined tendency being to purchase shop equipment of the higher grades. Propaganda relative to the flat-rate plan of dispensing service has not altogether fallen on deaf ears, as was shown by the lively interest of the service heads of the large and small shops in those articles of equipment that would eliminate costly operations that previously were executed by expensive manual skill.

Either because of the present status of the industry or because of a sincere effort to give the motoring public a generally higher grade article, the accessories offered the owner were as a whole better designed and more substantially constructed than has ever been offered to this class of buyers heretofore.

The power of the Chicago exhibition as a clearing house for the maker and the market can not be denied. The number of exhibitors present at the Chicago show but who were not seen at the New York were 45 in number and included some nationally known concerns.

A few of these who made their Chicago debut and which attracted considerable first night attention were—beginning in the Coliseum gallery—the exhibit of the **Columbia Axle Co.,** which although it did not reveal anything new in axles was a center of interest because of the instructive character of the exhibition. **The C. N. Hall Lamp Co.** has on display a new line of side and tail lamps of drum design and solid die cast construction that were both pleasing to the eye and gave the impression of durability.

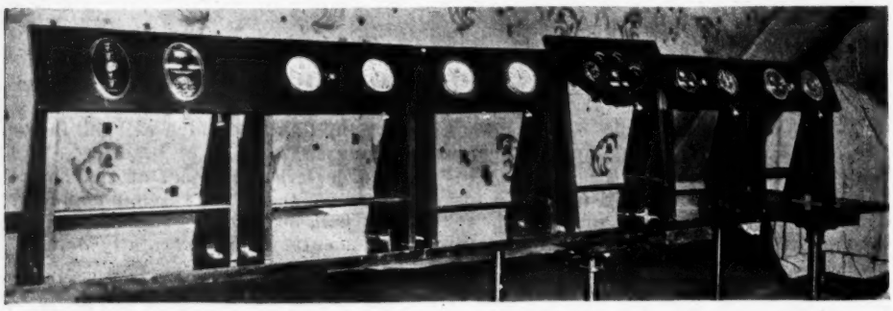
Of particular interest to the dealer was the exhibit of the **David Lupton's Sons Co.** This consisted chiefly of the necessary bin equipment for spare parts and accessories for the average size garage. The sectional bookcase feature of this equipment was clearly shown. Of interest to the same type of spectator was the complete line of service station labor saving equipment shown by the **Manley Co.** More than passing interest was centered on a miniature automobile factory which was on exhibition at the Veeder booth.

The Hartland Co. included in their exhibit a new and very simple sleeve removing tool.

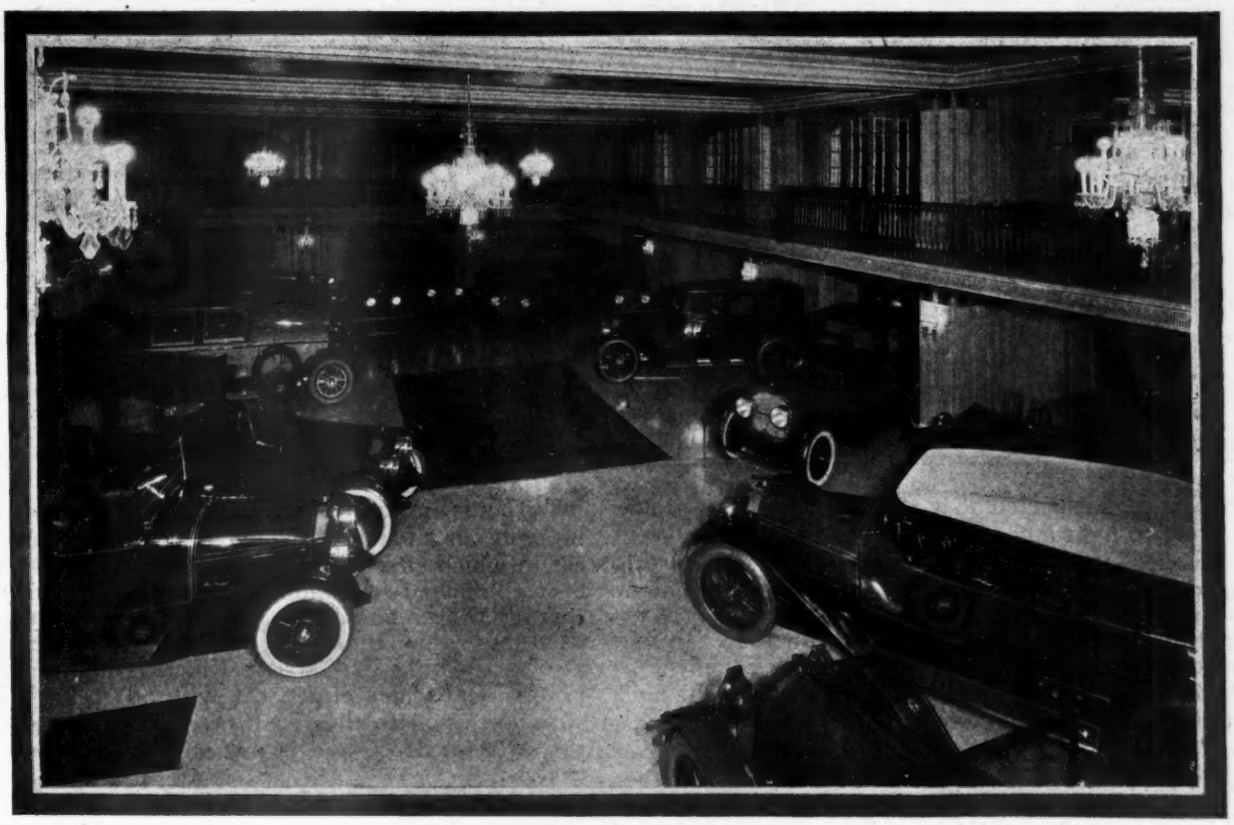
The entire absence of freak and questionable attachments for the popular make of cars was commented upon by those who have in the past been forced to compete with these concerns whose only virtue lay in their ability to attract the public. The attachments exhibited at this year's show as a whole showed the considerable development work that had been done by the surviving makers of this form of equipment.

The **Perfector** two-speed axle for Fords was the center of interest to those interested in this make of car, so it showed that an attempt was being made along engineering lines to develop a satisfactory four-speed mechanism for this car. By a refinement of detail the Perfector axle has been developed to such a degree that its application adds only nine pounds to the total unsprung weight. The extra reduction is secured by means of a planetary gear system which replaced the conventional Ford differential carrier.

Many interesting applications of the **Fulton Thermostat** regulator was shown at their exhibit. This product is more generally known under the name of Sylphon. A new fuel pump embodying this construction is now being developed by this concern. The installation of a sample pump on a dummy engine was a center of interest to many technical visitors, as were the exhibits of the **Norton** crank-



Waltham has brought out a newly designed combination clock and speedometer which is oblong in shape and quite out of the ordinary in appearance



View of the salon, which this year is being held at the Drake hotel. The last word in the coachbuilders' art is set forth at this exhibition. Both American and foreign cars vie with each other

shaft grinding machine and the **Heald** cylinder grinding equipment.

The Vibrating Specialty Co. exhibited one of the crankshaft balancing machines. The **Borg & Beck** booth maintained the well known clutch of this name as the main feature of attraction, while the attention was drawn to a new dash type radiator thermometer now being marketed by this concern.

The display of timers for Ford cars was limited this year to a very few companies who have been able to exist only because their article was of undoubted merit. Stop signals, although not greatly changed over the product of six months ago, show an improvement in construction. The lamps as a whole are being built heavier throughout.

The newly developed gasoline gages were of the hydrostatic pressure principle offer a product the degree of accuracy of which has never before been approached. The gages of this type were shown by three makers, all of whom reported very satisfactory sales and an unusual amount of inquiries from men in the technical field.

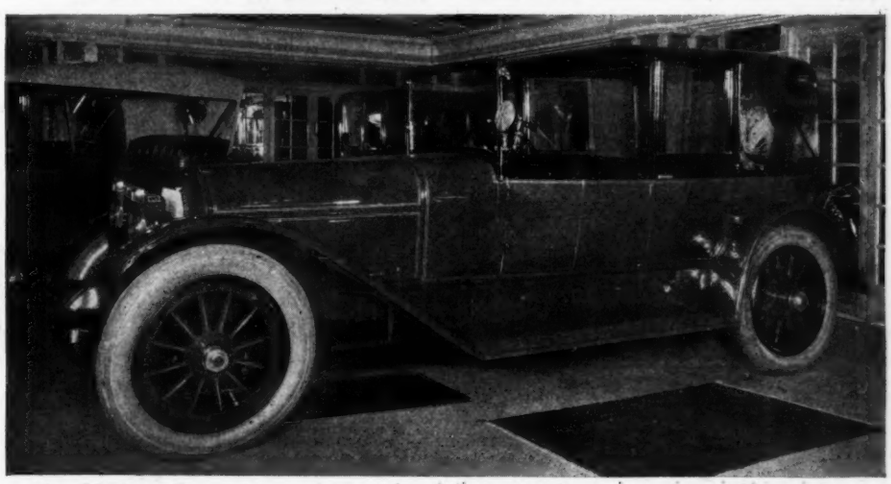
The most beautiful exhibit was in all probability the **Stewart-Warner.** Beside the universally known Stewart-Warner products there was also exhibited a new hot-spotted Stewart-Warner Ford carbureter. Among the interesting Ford specialty exhibits was the new oil gage being marketed by the **Rajo Motor Co.,** manufacturers of the Rajo valve-in-head equipment for Ford cars.

Anti-theft locks were shown by several concerns, the transmission type being predominant, with the steering wheel application a close second. The general feeling voiced by the individual exhibitors was to the effect that business was good. The buyers were described as being more critical and intelligent as to the quality of a product than heretofore.

The Automobile Salon

THE automobile salon at the Drake Hotel brought together the exhibits of the country's leading custom body builders and a few of the makers of the higher priced foreign and domestic chassis. The body builders include Fleetwood, Currier Cameron, De Causse, Graff, Kimball, Smith-Springfield and Rauch and Lang.

The foreign chassis shown are Isotta, Itala, Minerva, and Rolls Royce. The American chassis represented are Cunningham, Daniels, Duesenberg, Winton, Lafayette, Lincoln, Locomobile, Marmon, Packard, Pierce, Baker, R & L and Stevens Duryea. None of these chassis are new models, but the bodies mounted on them are representative of the highest skill in custom coach work. The salon this year was in a larger than usual percentage devoted to chauffeur-driven types of vehicles, although a few of the makers showed sedan, coupe and touring types.



An example of open body work at the salon. This shows a special body on a Locomobile chassis. Most of the cars at the salon are fitted with nickeled radiators

Several Car Makers Spring Surprises At Chicago Show

1922 Seems to Be the Year of Startling Announcements in Field of the Thousand Dollar Sixes. Hudson and Nash Show a Coach for First Time. Moon and Columbia Out with a Light Six

IT was not expected that the Chicago show would bring to light any great array of new models. Nevertheless there are always a few surprises and this year proves to be no exception to the rule. The Columbia has a surprise in the form of a new light six incorporating standard units and selling for $985. In this connection it might be worthy of passing comment to note that the real surprises of the year are in the field of the $1000 sizes. At New York we had such announcements as the Jewett, sponsored by Paige.

Hudson waited for the Chicago show to announce the new Hudson coach, which, like the Essex coach, brought out a few months ago, is a real economy closed car in which curves and other costly construction have been eliminated and simple straight lines substituted so that it has been possible to bring the price down to only $100 more than the seven passenger open car. Nash also is showing its Carriole which is a business and professional man's closed car with all the costly construction usual to the sedan or coupe removed. This car sells for $1350 and is mounted on a four-cylinder chassis.

ONE of the entirely new chassis at the show is the new Moon 6-40. This incorporates the new Continental 6-Y engine. It has similar lines to the distinctive larger Moon which is familiar to the industry. It is an asembled car, incorporating well known units, but different from the usual car in that certain additions are made particularly on the engine where the Sheppard valve has been added.

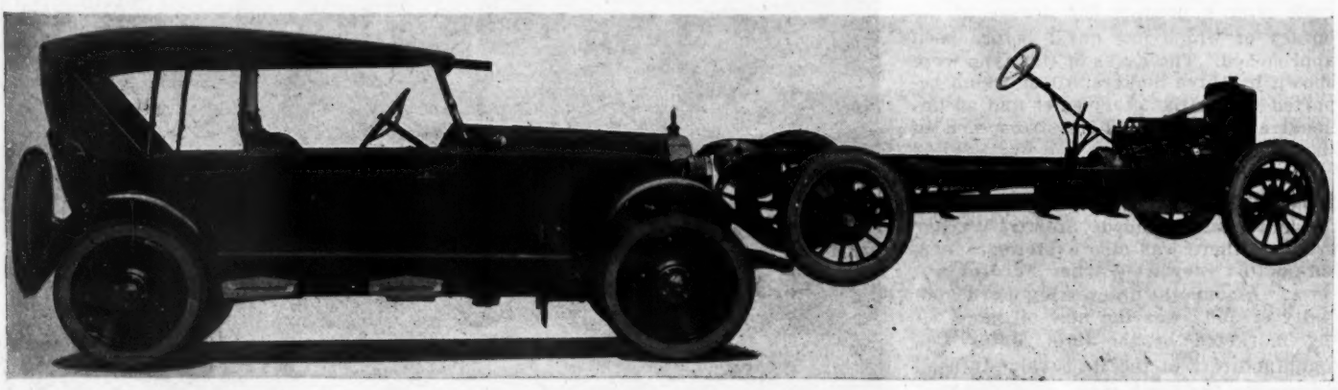
New Columbia Six

THE new Columbia Six is being shown at the La Salle Hotel, the exhibition being intended for dealers only as the car will not be in production before April 1. Besides the low price, $985, this car makes its appeal through its connection with the name of prominent parts manufacturers from whose products the car is assembled and its tasteful body lines. It incorporates the new Continental 6-Y engine which is claimed to develop 50.7 hp. on the block. The axles are Timken and the other parts manufacturers interested are equally prominent but may not at this time be mentioned. The clutch is a disk unit, the gearset a three speed selected, the tires 31x4.

The sample body which is shown at the La Salle is an Erdman-Guider product and is an excellent sample of the new straight-line flat cowl, flat hood type of line which seems to be rapidly gaining favor. The steel disk wheels blend very harmoniously with this type of line. The car is low so that the driver's eye is about on the same level as if he were walking along the street. The car weighs 2400 lbs. according to the manufacturers, and with the 3⅛ by 4 six-cylinder engine could be capable of good performance. It is mounted on 115 wheelbase.

The chassis layout for this new car is very clean, this feature being aided materially by the mounting of the hand brake on the front end of the propellor shaft. There is only one universal in the drive which is a Hotchkiss type with long semi-elliptic springs. The engine is unit power plant mounted directly in the main frame, the arms on the bell housing acting as a substantial cross member. There is a cross member a little behind the center of length of the chassis, this being a flat inverted U section heavily gussetted to the main frame. Behind the rear axle there are two rear cross members between which the cylindrical gasoline tank is suspended.

The body shown was painted a dark green with a golden yellow stripe, the trim being in black and nickel. This color will be standard. The fittings are all up-to-date, including the barrel type of lamp, oil cup chassis lubrication, no exposed bow in the top, sloping windshield, plaited upholstery, exposed door handles and exterior hinges. An economy feature is the elimination of the



Columbia has brought out a new light six-cylinder car to sell at $985. The car and chassis are shown above. It uses the new Continental 6-Y engine, said to develop 50.7 hp. on the block test

rear wheel housing giving a sort of sportster effect, although the rear seat width is 41 ins.

Nash Carriole

THE Nash Carriole, a five-pasenger enclosed car made its bow at the Chicago show. This car is entirely new in the Nash line this year and is mounted on the four-cylinder chassis. It is designed as a light enclosed family car. The price is $1350 f. o. b. factory.

The body of the car is an all metal construction similar to that used on the higher priced sedans and coupes. The front seats are divided and both may be folded forward inasmuch as they are of the parlor car type. The driver's seat folds against the steering wheel and the right hand seat under the cowl when not in use. The front seats are upholstered in genuine leather and the rear seat in wool cloth as well as the interior trimming.

There are two doors, one on each side, the left hand door being at the driver's seat and the right hand door directly opposite. Both doors are wide enough to make entrance and exit an easy matter. The front and rear windows may be raised or lowered by the turning of a handle. In the back of the car is a large plate glass window. There is a dome light for interior illumination.

List price includes cord tires. It is pointed out by the makers that the low price for this car has been made possible because of the adaptability of its body design to volume production.

Moon Light Six

MOON has added a new six-cylinder car known as the Model Six-40 to its line. This is a 115 in. wheelbase to sell at $1295. It is built up of such units as Continental engine, Timken axles, Spicer universal joints, Borg & Beck clutch, Delco starting, lighting and ignition, Exide battery, etc.

The engine used in this car is the new model Continental 6-Y, having a bore of 3⅛ in. and a stroke of 3¼ in., one of the features of this engine being the use of the Sheppard valve. In this valve the conventional type of L head layout is used with the exception that the valve spring is placed above the valve and engages with a rod or stem resting on top of the valve head. The engine is said to show 46 hp. on the block test. Camshaft and generator drive are by chain and are so arranged to be easily adjusted. The crankshaft is four bearing. Lubrication is force feed.

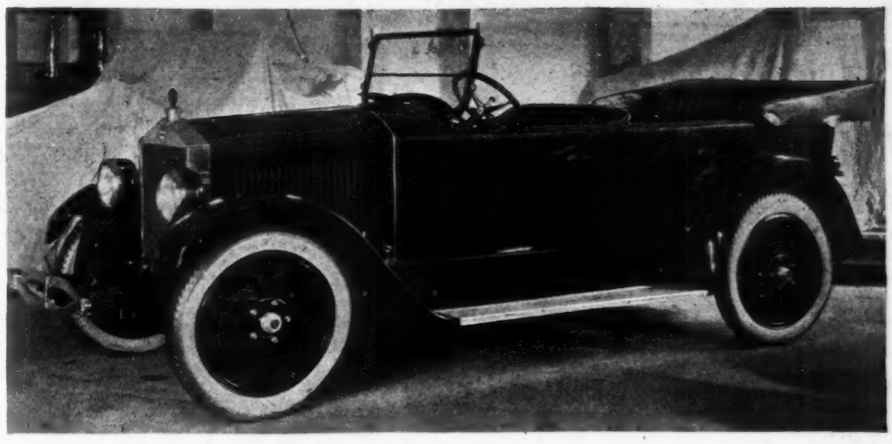
A new design has been incorporated in the frame in which four cross members are used. A charcteristic of Moon frame construction is the molded gusset plate on the rear of the frame to add stiffness and afford protection to the gasoline tank.

One of the features of the Timken axle used in this car is the mounting of the pinion shaft. The shaft bearings are mounted fore and aft of the pinion gear, which reduces the overhang on the pinion shaft and assures a positive method of lubrication to the axle proper. Other details include spiral gears, foot brake on rear axle, emergency brake on transmission. The springs are semi-elliptic, the front being 36 in. long, the rear 54 in. The propeller shaft is of large diameter to prevent whipping at high speeds.

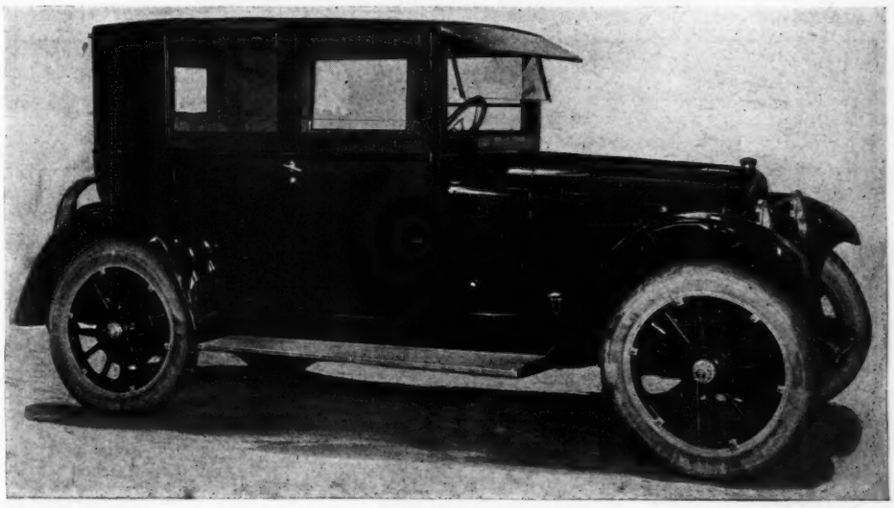
Other features of the chassis include a Gemmer steering gear with an 18 in. wheel. The radiator is a cellular type with a shell made of German silver. The gear shift lever is provided with the Johnson theft lock. The fuel tank is placed in the rear and the bracket of the extra tire carrier is fastened to the gusset plate protecting the tank. The tank is fitted with an automatic gage.

The body is built of silver finish steel. Deep one piece stamped fenders of good design are used. The one piece construction makes them rigid and free from rattle. The headlights are of the drum type with silver nickel rims and deflecting lenses and have dual lamps for driving and dimming. The upholstery is genuine black leather and the side curtains are of the same material as the top and are fitted to open on the doors. The cabinet at the back of the front seat is used to carry the curtains and this cabinet is finished in polished hard wood.

The tire size is 31 in. x 4 in. and the tires are cord. Wire and disk wheel equipment includes an extra wheel. The car shown at the Chicago Show was fitted with disk wheels. One of the things noted about this car is its low and rakish appearance. The radiator design is substantially the same as that on the larger Moon car.



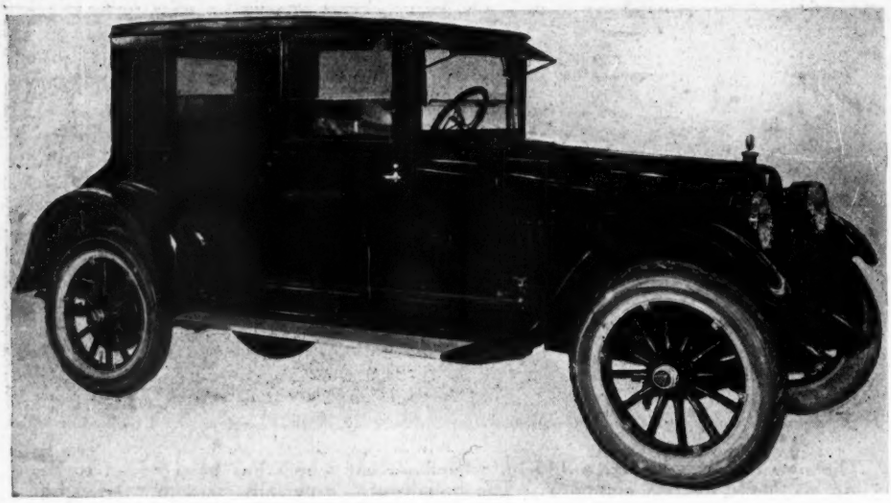
The new Moon light six, a 115-in. wheelbase car which has been added to the big six made by this company. The body work, especially, is well carried out on this car



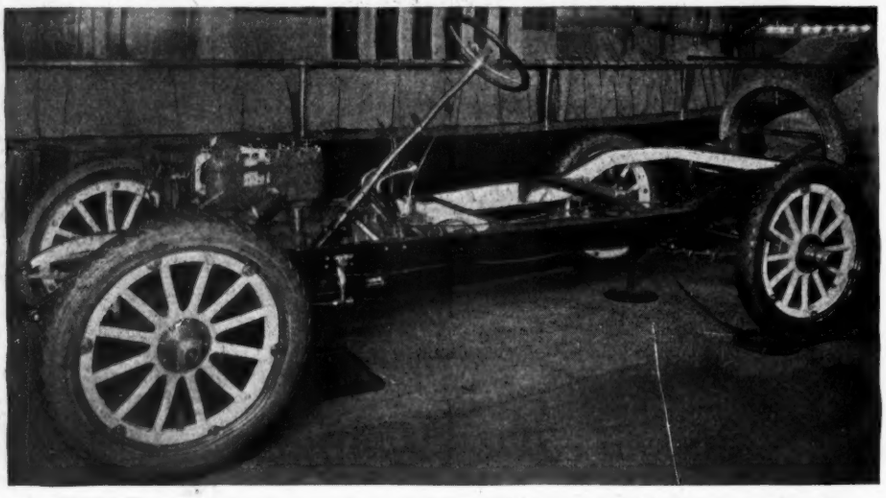
The Nash Carriole which is mounted on the four-cylinder chassis. The design is said to lend itself especially to quantity production because of the elimination of curved surfaces

New Hudson Coach

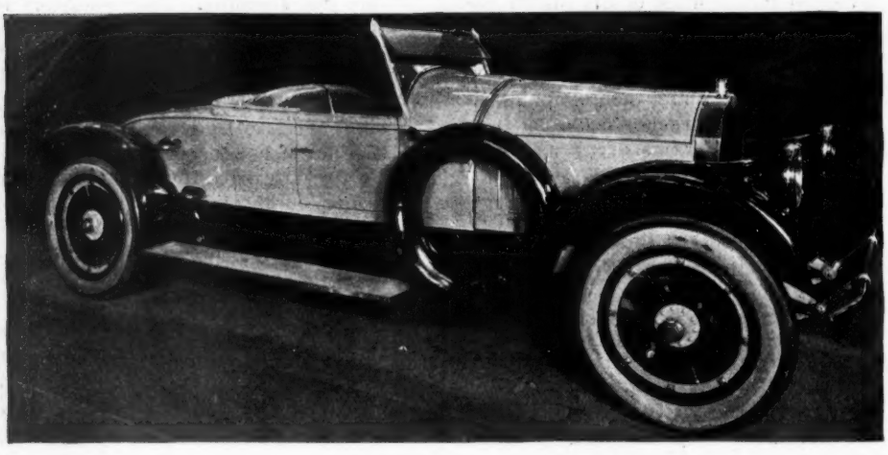
THE new Hudson coach which is to sell at $1795 or only $50 more than the 7-passenger phaeton and $100 more than the 5-passenger is on exhibition for the first time. It incorporates a number of economy features in closed body construction. A large part of the economy



Three-quarter view of the Hudson coach, which resembles very much the lines of the Essex coach brought out a short time ago



Gardner is showing a chassis which, while about the same as last year, contains many refinements. A high pressure lubrication system for the chassis has been adopted



One of the fine examples of coachwork is the roadster body on a Pierce-Arrow chassis. The car is replete with many refinements

has been affected by the elimination of curved pieces of wood.

Substantially all pieces of wood in the body framing are cut on straight lines. This not only materially reduces the cost in preparing the wood framing for assembly, but also, in a number of instances, has resulted in making the assembly work much easier and far more readily handled on an interchangeable basis. An additional saving has been made in the use of two in place of four doors.

This has been made possible by the adoption of individual Pullman-type seats in front in place of the usual fixed type. These seats fold out of the way to allow access to the rear seat. The car is a 5-passenger design. The rear seat is continuous across the body in the usual way.

The type of body construction employed is such that it is possible to put it together in a number of sub-assemblies. The body may truly be said to be assembled instead of built up in the usual manner. There is no great amount of tacking to be done from the inside of the body. This can practically all be done before the body is put together. The roof furnishes a good example of this type of construction.

The entire roof is practically a sub-assembly. It is a soft type covered with artificial leather. The actual ceiling or roof lining is put on before the roof is put on the body. The roof is then put over the top of this lining as an independent assembly. Additional economy has been secured by making as many parts of the body as possible of the same dimensions.

Lexington Has New Model Chassis

LEXINGTON is showing a Series U chassis which it will put into production along with the present series S. & T. The new chassis, while fundamentally the same in design as the others, differs somewhat in regards to the wheelbase, the newcomer being one inch longer than the Model S wheelbase, or 123 ins.

There also has been some slight changes made in the frame design on the U-chassis, particularly in the matter of cross members which have been made heavier and add materially to the stiffness of the frame. The wheelbase on the Series T, 128 ins., remains the same. One of the features on the new Model U-chassis are the extremely long rear springs used. These are semi-elliptic, nearly 60 ins. long.

The powerplant in this car is the Ansted engine which this company has been furnishing as regular equipment on one of its chassis. A few changes have been made in the Ansted engine used by the Lexington, but these are of a minor nature.

CHARLESTON TRADE ELECTS

Charleston, S. C., Jan. 27—At the annual meeting of the Charleston Automotive Trades Assn. J. Robertson Paul was re-elected president. Eugene F. Ostendorff was again selected treasurer and J. Gilmore Smith secretary. E. M. Shingler was elected first vice president and William Heyward second vice president.

Detroit Sales Pass 1921 Mark

Business In Every Feature of Detroit's Annual Show

Salesmen Declare Sales in Large Volume Will Follow — Attendance Largest on Record

DETROIT, Jan. 27—Detroit's automobile show of 1921 was designed so that people could not resist buying and the plan has worked out.

To overcome the skepticism in the public mind as to final revisions in prices, and to induce buying in the face of the general business depression, it was necessary to go to unusual lengths in creating buying appeal. The Detroit Automobile Dealers' Assn., forearmed with this knowledge, went far beyond the bounds of the average year's show and it has been rewarded.

Attendance at the show ran far ahead of farmer years, by mid-week the turnstiles having registered 4,000 more than any previous year.

Buying is far ahead of 1921's mark and compares favorably, particularly in the low and high priced field, with average years.

Hesitancy has been experienced in the medium price field, ascribed in the main to speculation on the retroactive price to be announced by one of the big producers, but there are evidences of big buying in this field when this uncertainty is cleared away.

Show for Business

Dealers say it is a "business" show in everything that the word conveys. Satisfaction is expresed at the volume of sales, at the interest of attendance, and with the practically definite assurances of buying with the apeparance of driving weather.

Detroit is a city which in summer is alive with motor cars. In winter most of its cars hibernate. The show is being held in the late stages of the hibernation period with zero weather prevalent. It is not the season when anyone here feels the urge of the open road. It is the time, however, when decisions are made as to what kind of a car will be driven in the driving weather, and many a salesman at the show is treasuring a card which is as good as a sale two months from now.

The effect of price indecision has been overcome to a large extent by the introduction of special paint jobs, and specially equipped cars, which make a buying appeal that cannot be overcome by a deviation of slight sums of money in cars of other manufacture. Except where cars are to be used almost exclusively in every-day business life, there is a movement toward individuality in motor car possession which finds its best expression in the special paint and special equipped car. When it is considered that these cars mean the expenditure of from $100 to $200 over the price of the standard model of similar make, it can be seen that the price appeal is losing some of its potency.

Judging from indications at the Detroit show it may be expected that 1922 will witness a distinctive movement on the part of city buyers toward cars expressing personal tastes in paint treatment and refinements. There is almost a visible effort on the part of manufacturers to encourage this, particularly as to roadsters and cars for light use.

Crowds Fill Aisles

Detroit, as the hub of the automotive industry, is naturally very much interested in cars and their progress, but this alone would not explain the presence of the huge, surging crowds filling the aisles of the show each night. Dealers see in the attendance and glean from inquiries a fundamental buying desire which presages good business in 1922 and business as soon as general conditions advance a few more stages toward rectitude.

Right here it might be said that the salesmen are sanguine over the prospects of good business during the year, particularly over business developing as a result of the show. There is a wholeheartedness in their treatment of a visitor, and in their interest in seeing him buy right (one of their cars), which gives the impression that dealers have been successful in keying up their staffs to a point where genuine cooperation may be expected in the battle for business. Also there is no tendency to knock the car "you are driving now." No one can leave the show with the feeling that a real, honest effort has not been made to sell them.

The curiosity of visitors as to the "innards" of a car has been amply looked after in the presentation of open chassis. Practically every exhibition has its open chassis. The Willys-Overland, Knight exhibit has an open chassis under which is mounted a telephone amplifier through which a demonstrator in a distant booth describes the mechanism as it slowly revolves.

A number of the exhibits have their prices mounted upon imitation Michigan license tags, which this year is a bright red, and it makes an attractive presentation of the "bad news."

The Ford exhibit is missing from the show this year, the explanation being given in newspaper advertising that congestion about the booths in former years had prevented individual attention to visitors. Instead the Ford dealers of the city staged exhibitions in their sales rooms which were said to have borne good results.

Newspaper advertising of the show in the main consisted of ads by dealers of their cars and the number of their booths, but the association ran an advertisement in the attraction columns of the papers, setting forth the place and hours of the show. An attractive advertising feature was the placing of brightly colored disk, wire and wood wheels in windows of stores in the shopping district with small cards stating the show was in progress. This helped in a large measure to center public attention.

A very fair idea of the dealer's belief in the potential sales possibilities of the show is found in the extensiveness of the local advertising campaign carried on during the week. This was carried out to an extent which dealers frankly admitted they had not anticipated in the days previous to the show opening.

President Guy A. Simons and Manager H. H. Shuart, of the Detroit dealers' association, expressed the general feeling of dealers as a result of the show as very enthusiastic. Actual buying ran far ahead, they said, of last year and measured up satisfactorily with other more prosperous years. There were few who could not credit a number of sales directly to the show, and there were none who could not point out a goodly amount of busines lined up by it.

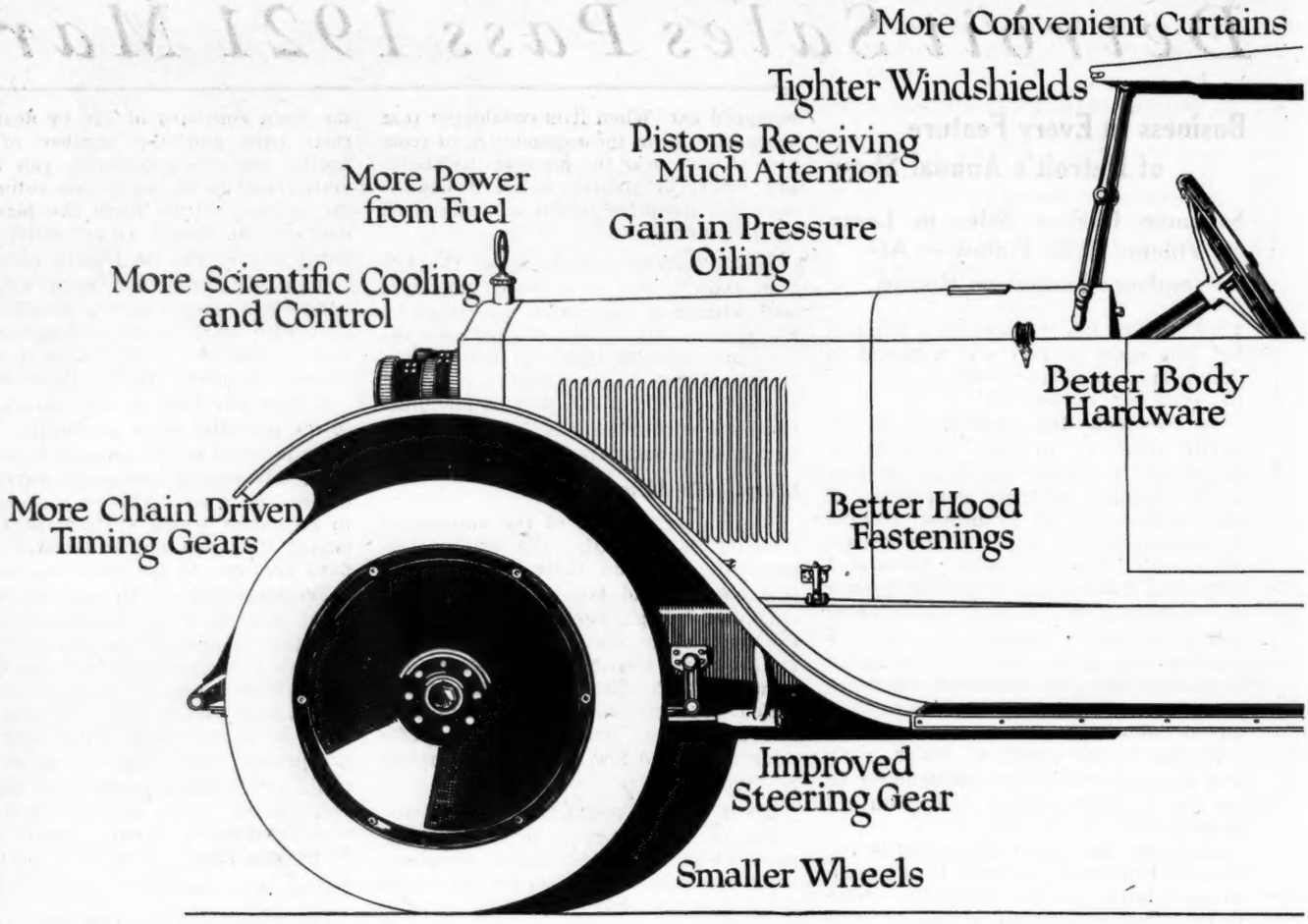
Buying Runs Strong

On Wednesday of show week Detroit day was celebrated by the attendance of the Michigan Automotive Trade Assn., which held a noon-time meeting and luncheon at the Statler. At this a detailed report was made by Manager W. D. Edenburn of the year's progress to date, with a sketch of the inauguration of the Michigan show circuit. Support of the Condon bill was urged upon dealers as necessary to curb car thefts.

President Guy S. Garber, of the Michigan trade asociation, spoke briefly of the Saginaw dealers used car plan which he suggested for adoption by all the dealers of the state as a means toward stabilizing used car values. By this plan the dealer of any car fixes a definite price at which trade-ins of cars of this make should be accepted. When a price change is made by the factory a revised used car price list is mailed to all dealers cooperating in the plan. This has worked out successfuily in Saginaw because dealers have been faithful in adhering to it and its general adoption by the members of the state association will be sought.

COURSES IN SALESMANSHIP

Monmouth, Ill., Jan. 27 — Thursday night classes in salesmanship have been instituted in the Monmouth Plow factory under the supervision of and conducted by factory heads. Instruction is given to all members of the factory force and is not limited to the sales personnel.



TRENDS IN MOTOR

WHILE there is no one particular trend in evidence on the cars for 1922, with the exception, possibly, of that in the way of providing better facilities for handling fuel, close inspection of the cars reveals some interesting facts about the improvements which steadily have been going on in the industry.

THERE has been much effort devoted towards ridding the cars and engines of such weaknesses which formerly were the bane of the driver and service man. In view of the recent trends in prices, we hardly can expect to see many added features in the cars which contribute to luxury, but we do see structural details which, heretofore, have been uncommon in cars of certain price classes.

WHEN we come to studying some of the more important trends, we find that, among others, these are apparent:

1—Better provisions on the engines for carbureting present day heavy fuel.

2—More rigid frames by use of heavier stock or deeper section and stiffening the frames with more cross members.

3—Increased use in the fabric type of universal joint.

4—Adoption of the transmission brake, particularly in low and medium priced cars.

Most Progress In Design Has Been Made Where It Was Most Needed

5—Increased use of the single plate clutch.

6—Tendency for fitting ball or roller bearings to steering gear knuckles, especially on larger cars.

7—Practical elimination of grease cups and substitution of high pressure systems of chassis lubrication.

8—Increased use in lighter reciprocating parts in power plants, such as alloy pistons and valve parts, also clutch parts, etc.

9—Better windshields and tops, with a tendency towards the permanent top.

10—Better cooling and temperature control devices.

11—Increased use in the silent chain for front end drives.

12—Almost universal adoption of the spiral bevel gear drive in rear axle.

13—Tendency for oil lubrication of metal universal joints.

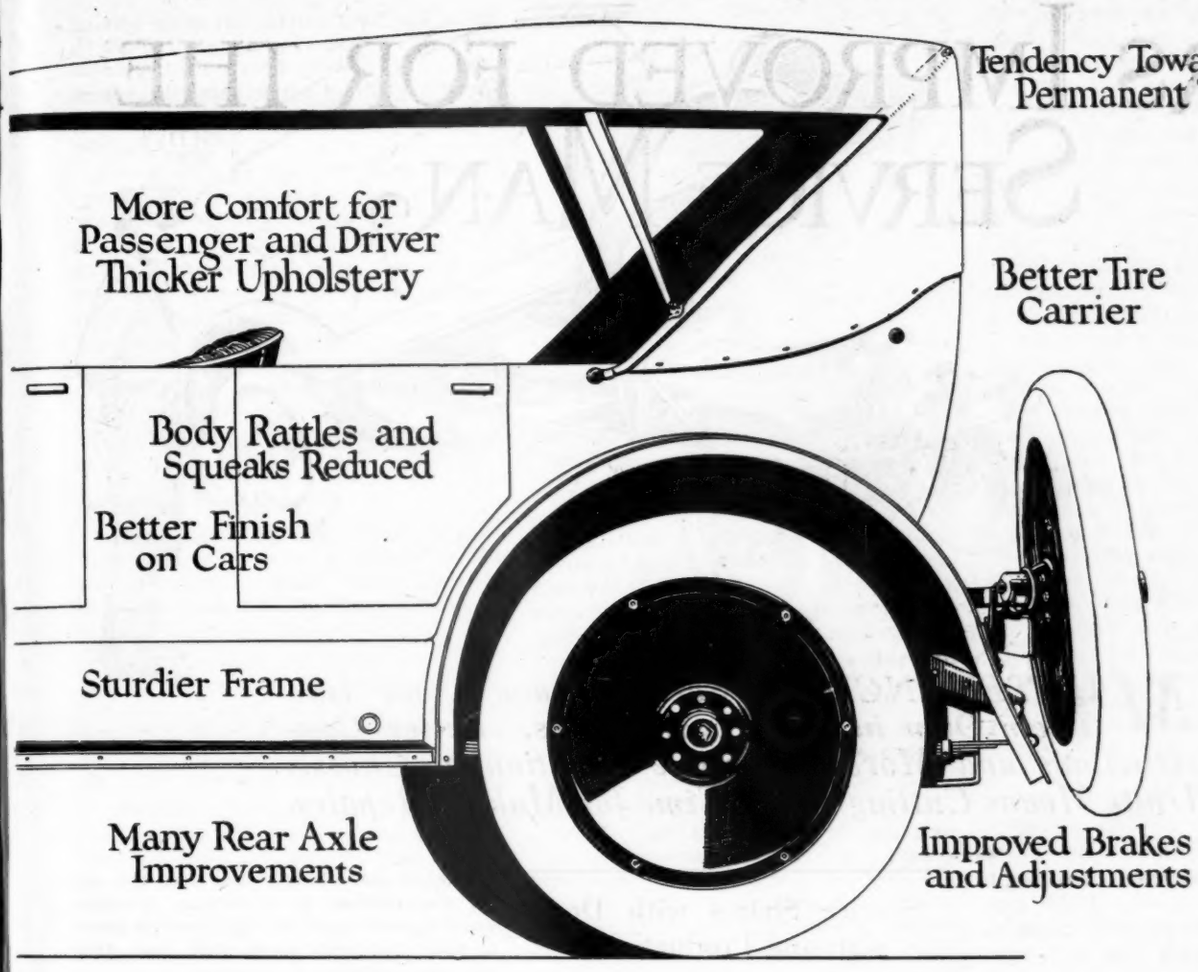
14—Further increase in the use of disk wheels.

15—Widespread adoption of devices designed to overcome rattle in chassis and body.

16—Use of better body hardware.

17—Rapid gain in the use of full pressure lubrication of engines.

18—Better quality of upholstery material, with a tendency to get seats slightly lower and more comfortable.


Tendency Towards the Permanent Top
More Comfort for Passenger and Driver Thicker Upholstery
Better Tire Carrier
Body Rattles and Squeaks Reduced
Better Finish on Cars
Sturdier Frame
Many Rear Axle Improvements
Improved Brakes and Adjustments

CAR DEVELOPMENT

1922 Cars Characterized by More Sturdy Construction and Better Materials

19—Better tire carriers.

20—Better finish on bodies and fenders and tendency to fit more nickel-plated parts.

THERE is a growing tendency to provide devices for better carburetting of the fuel, most of these being in the nature of some sort of hot-spotting device, or jacketing part of the intake with the exhaust. Many of the cars are provided with devices giving a summer and winter setting whereby the mixture can be controlled so that the charge is somewhat richer when the engine is cold than when it is warm.

FRAMES, in the main, are stiffer, with more cross members than formerly, particularly in the use of tubular members. The side rails seem to be of deeper section and, in many cases, the frame material itself is of thicker gage.

THE fabric type of universal joint has made much progress. It makes an easy installation possible and one of its salient features is its quiet operation. It is especially desirable to use it where the drive is practically a straight line.

MANY makers are fitting the transmission type of brake and, while there may be some objections to this from an engineering point of view, it is a handy installation for the driver and service man, as the adjustment is very easy to make, as a rule.

CLUTCHES have been improved in many respects. There have been endeavors made to overcome chattering or noise and a tendency to failure to disengage in such clutches. Many makers have made the clutch parts, particularly the spinning parts, lighter, to facilitate gear shifting.

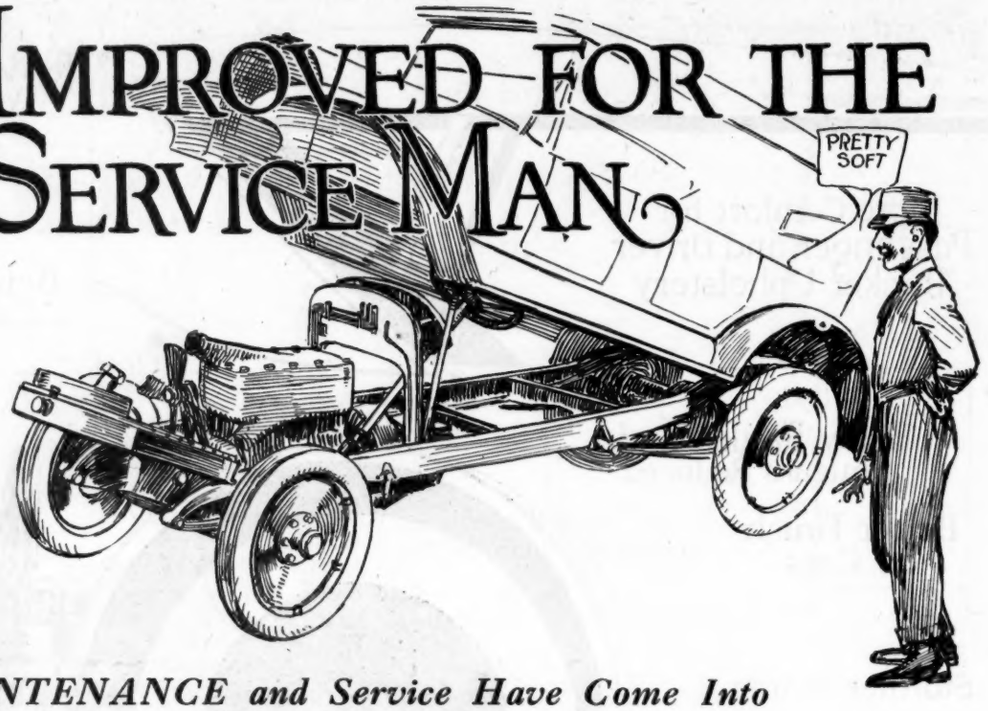
STEERING has been improved by the use of heavier types of gears and installation of ball or roller bearings in the knuckles, not only at the wheels, but on the vertical part of the knuckle. Obviously, a car so fitted will turn easier, especially when the wheels are to be cramped much.

THERE has been a wholesale weeding out of the grease cup and the substitution of the high pressure system of chassis lubrication, whereby the lubricant is forced to the different parts under pressure. This has been a great step in the servicing of motor vehicles.

RATTLES in chassis and body have been practically eliminated in many cases by more rugged parts, shackle bolts which compensate for wear, stronger tire carriers, better body hardware, etc.

BODIES are better built and the better coachwork is augmented by a higher grade of upholstery material. There also is a tendency for the makers to equip their cars more completely than formerly. This includes such things as spotlights, bumpers, windshield wipers, locks, etc.

CARS IMPROVED FOR THE SERVICE MAN



MAINTENANCE and Service Have Come Into Their Own in This Year's Cars. Better Constructions and More Accessible Location of Chassis Units Means Cutting Down Time for Making Repairs.

WHEN the service men begin to work on the 1922 cars they will have good cause to be happy. The cars are more accessible.

True, there still remains some refining work to be done on some of our cars, so far as accessibility is concerned, but generally speaking the pleas of the hundreds of dealers and service men for cars easier to work upon have been answered. The factories making cars realize that the car owner is, after all, the means for keeping the machinery of the automotive industry in motion.

The car owner will not spend his money for a car on which the maintenance costs are out of proportion. Dealers are not anxious to handle a car on which it is difficult to give good service. Service conditions generally cannot be improved unless the car maker does his part in the design and construction of the vehicle.

Flat Rate Discussed

Flat rate prices on repair work are difficult to establish on a car or engine where hours are required to get at a job, when the actual job in question may require only a few minutes. Something is obviously wrong when a wrench manufacturer brings out a line of excellent speed wrenches only to find that the car maker has not allowed sufficient clearance around the nuts and bolts to permit of their use.

Service Shares with Design and Production

THE 1922 cars judged from the viewpoint of a service man are by far the best ever turned out by the American makers. The constant pleas of the dealers and service men, service associations, the standardization work of the S. A. E., and others have resulted in the makers giving as much attention to the serviceability of their product as they do to design and production.

Half of the more common service problems are solved by correct design and building of the car, truck or tractor, as the case may be.

In this year's cars we are seeing the results of the work that has been going on for some time to make cars more accessible. It has not been one company's doing, or one man's doing. Everybody has had a hand in it. The customer who complains to the dealer has done a lot. Likewise, the dealer and distributor have helped. The service organizations which have been established in many parts of the country have contributed much valuable matter.

The Society of Automotive Engineers, through its standardization work, has lessened the cost of service work on motor vehicles by a sum impossible to estimate and the work is still going on. It means something when you can get all the makers in a certain industry lined up and agree to build certain parts of their products along such lines that interchangeability is possible.

There has been a great work going on in the factories themselves. The service on a car now is becoming the dominating factor in design, because only as the car gives the customer what he has paid his money for will that car continue to thrive. It is common these days to go into a factory and see the engineer and service manager working together on a design; whereas, before, the service manager was largely looked upon as only a dispenser on parts to the branches.

The process of making the cars more accessible has been going on for some time, but it is in this year's cars where we are able to see the real strides that have been made. This is due to some extent because the makers are not now rushed so greatly in production.

Desire to Sell

It takes a long time to change the construction of some unit in a car, because it means new drawings, jigs, patterns, fixtures, machinery, and often a change in the routine of production. Even the changing of one bolt may run into many thousands of dollars for new patterns and tools. Old inventories have been pretty well worked up and this is another reason why the "new stuff" is beginning to come through.

Then, too, there is the desire to sell. All of these factors have been brought

to bear upon the car for 1922, and many of them have made it possible for the makers to offer to the service and maintenance division of the industry a product representing the last word in accessibility.

The chassis of the 1922 cars, collectively speaking, are the cleanest looking which have been produced thus far. It is true that the coming of the unit type power plant several years ago had its effect on getting a clean and simple looking chassis, but it is equally true that the chassis having a separate mounting for the gearset, of which the Durant Six is an example of the brand new cars, are clean in design, even though there are a few more exposed parts.

Hotchkiss Drive Helps

Accessibility and cleaner layouts have been secured in many instances by the use of Hotchkiss drive; that is, a construction whereby the rear springs of the car take the drive and torque.

A good example of where simplification of the chassis has been secured in this manner is the new Chandler, which has discarded the torque arm formerly used and also the metal universal joints, the latter having been replaced by joints of the fabric type.

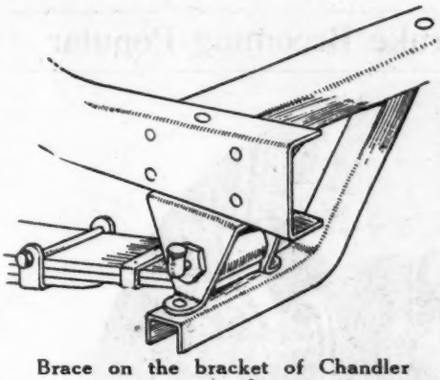
The elimination of the torque arm means doing away with the hinged joint on the rear axle, which always has been more or less difficult to lubricate, and also the hinged housing on the cross member containing the buffer springs.

In providing for the Hotchkiss drive, it is necessary that the bracket for the front end of the rear spring be very rigidly fastened, because at this point all of the driving strain and torque reaction of the axle is taken. Chandler has done this by bracing the bracket with a strip of channel iron riveted to the cross member.

Simplification of Chassis

The engineers have given considerable attention to the simplification of the chassis by incorporating two or more units into one wherever such construction is practical. For example, when it becomes necessary for the service man to attach a bumper to a car, it generally means the loosening up of the front spring bolt where it passes through the frame and in some instances drilling the frame for other bolts. Or, the bumper may be attached by clasps. In the past these installations have been known to loosen and cause considerable annoyance.

Now, there is every reason to believe that the future will see more and more cars coming through on which provision has been made for the ready installation of bumpers. In one case, the maker has made the front frame horn with an integral lug for attaching the bumper. In such an installation there is little chance for the pumper ever becoming loose in service.



Brace on the bracket of Chandler rear spring hanger

One Unit in Place of Two

This idea of making one unit serve the purpose of two is examplified in various other ways on the chassis of some of the cars this year. Thus one maker fits a cross member which combines the function of cross member, splash apron and engine support. It is quite common these days to find the bracket for the front end of the rear spring acting also as the supporting member for the brake rod levers.

Wherever such construction is possible, it not only affords less chance for the parts to become loose, but also makes for a better production job.

Much has been done to facilitate chassis lubrication. There has been a wholesale elimination of grease cups and in many instances the makers have substituted graphite impregnated bushings in such places as the spring shackles, brake rod operating shaft bearings, etc. The grease cups also have given way to the high pressure system of forcing the lubricant to the various chassis parts.

In this case, special fittings are attached to the parts to be lubricated, the lubricant being forced to the bearings by a gun operated by hand pressure. Much time is saved in service and better lubrication is secured.

Hand Pressure Operation

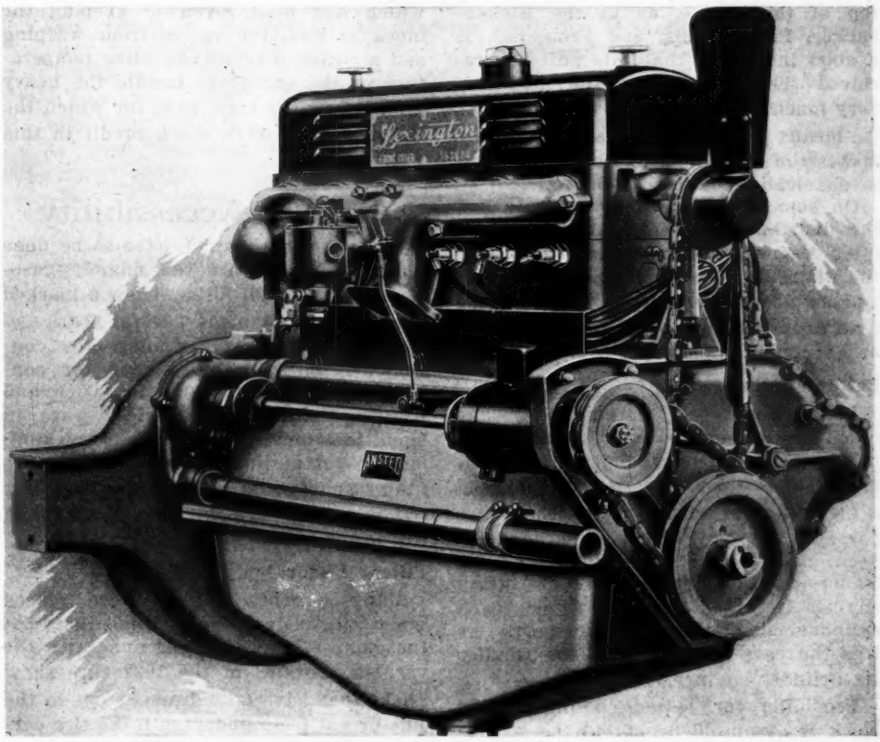
A feature of such a system is that the old lubricant and dirt are forced out of the bearings by the pressure before the fresh lubricant is introduced.

One of the things which will appeal to the service men is the tendency for car makers and engine makers to fit their engines with separate electrical units, rather than to combine the generator and ignition unit, or generator and starting motor. From a production standpoint, it probably is much easier and cheaper for the car maker to fit a single electric unit, but from a service standpoint there is a distinct advantage.

Where the ignition unit is mounted on the generator, it means if the latter must be taken off for some reason, the car is rendered useless because of the absence of the ignition unit. This is not the case where the distributor is mounted on the timing case ahead of the generator, which generally is attached by a flange to the rear of the case. Disturbing one does not interfere with the other.

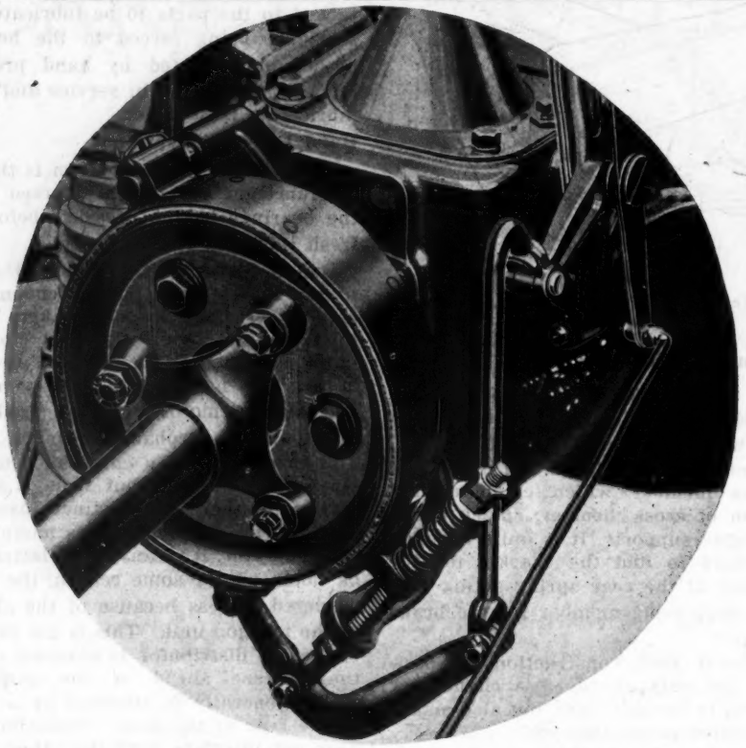
Paige Engine Good Example

The Paige engine is an excellent example of good practice in mounting the electrical units. Here the coil also has been placed in front of the engine, where it is not subjected to undue heat. The Ansted engine used in Lexington and Durant Six also is a good example of



An example of accessibility. All units are easy to get at and one can be removed without disturbing the others. Note the oil filler on top of the engine

Type of Transmission Brake Becoming Popular



Typical layout of transmission brake. This shows how easy the adjustment can be made, which is probably more often needed with this type of brake owing to its necessarily smaller diameter

where the units have been placed accessible and in such a way that there is no interference.

What is true of these cars in this respect is true of many others. For instance, the placing of the distributer on top of the engine, as in the Rickenbacker, Packard Six, and Frontenac, is a good indication that this unit has received the attention of the designers very much. Placed on top of the engine, it means short wires and certainly makes the unit about as accessible as it is physically possible to do so.

On some engines which formerly had the distributer placed at the rear and often under a mess of wires and rods, the distributer now has been shifted to a more accessible position, so a service man does not need a mirror to see the breaker point opening.

Better Cooling

Better cooling of the engine means much to the service man. While there has been no radical change in the cooling systems themselves, there has been a great deal of work done on the water passages in the blocks. These have been made larger in a number of instances and some makers now are fitting engines in which water surrounds each cylinder completely and not partly as was the case with some of the smaller six cylinder engines.

Providing for better cooling of the block is of untold benefit to the service man, because heretofore an engine might come into the shop with distorted cylinders and pistons and with no good reason apparently for doing so. Warpage of the block by insufficient cooling of the walls is something over which the service man has no control and yet something with which he must struggle.

The increased amount of attention which has been given to keeping the block in line, the valves from warping and securing a better operating temperature of the engine to handle the heavy grade of fuel is something for which the car makers deserve much credit in this year's cars.

General Accessibility

The operations which have to be done most frequently on a car, namely, gasoline filling and oil filling, show a marked improvement. Cars of several years ago seemed to be designed more for convenience in the factory than for convenience in the hands of the owner, and many gasoline filling devices were in such locations that it was very difficult to get at them, especially with the filler spouts on gasoline hose and pumps which are in almost universal use today.

Fillers Under Body

Many of these fillers were placed under the body in such a position that the pump filler was bound to scratch the varnish Several of the 1922 cars show fillers that have been brought out to the side or out from underneath the tire carrier so that they are accessible.

Oil fillers have been raised up or brought out from inaccessible places in several instances and there is a tendency to use the bayonet oil gage instead of the float oil gage. Examples are the Wills Sainte Claire, Hupmobile and Cole. The bayonet is simply a round piece of metal with a jetted shoulder which screws into a jetted hole on the side of the crankcase. When this is unscrewed and taken out, the level of the oil can be readily determined by noting its height on the bayonet.

The simplification of oil drains in the crankcase have not made very much progress. The plugs and other draining methods are still very inaccessible and do not show much improvement in this respect. With the more frequent necessity for draining the crankcase, owing to dilution of the crankcase oil, this ease of draining is one that certainly must be considered by the car manufacturer sometime soon.

Marmon Has Convenient Method

The Marmon 34 is one car which has a convenient method of draining the crankcase. On the side of the crankcase there is an oil reservoir drain valve. This operates from above, so that the operator of the car does not have to get down underneath in order to drain the crankcase before he replenishes the lubricating system with fresh oil.

The oil drain on the new Cleveland Six, shown herewith, has been made very accessible. A rod terminating into a handle is placed on the side of the crankcase and turning this rod drains the oil.

Better means for draining the oil are possible in today's engines because of the tendency to lubricate the engines by the full pressure feed system; that is, the system whereby the splash troughs conveniently placed under the rods are eliminated. Where troughs are employed, it is not possible to drain these when the crankcase is drained, consequently, the fresh oil will immediately be contaminated by the thin oil remaining in the troughs.

With full pressure feed where the oil is carried in the sump it is evident that draining will remove all of it and, therefore, those devices which allow the service man to perform the operation from above, as in the case of Marmon, and Cleveland, for example, are to be recommended.

Buick Oiling System

The oiling system on the Buick four is by circulating splash, using a gear pump which is located in the oil pan and driven directly from the camshaft. This pump is so constructed that it can be taken out from below for cleaning or inspection, and is entirely exposed to view when the pan is dropped. This car also provides for automatic lubrication of the single universal joints. It is enclosed in a ball joint connected to the rear end of the gearset and is lubricated from the gearbox.

Chassis lubrication has been very much improved and a great many of the

models are now provided with Alemite or other systems of lubrication. The Hudson has a new chassis lubricating system taken care of by a new type of oiler which does away with grease cups altogether. The oiler contains a reservoir and a wick feed and a new type of oil can incorporating a pump is provided to fill these reservoirs.

Change in Valve Tappet Mountings

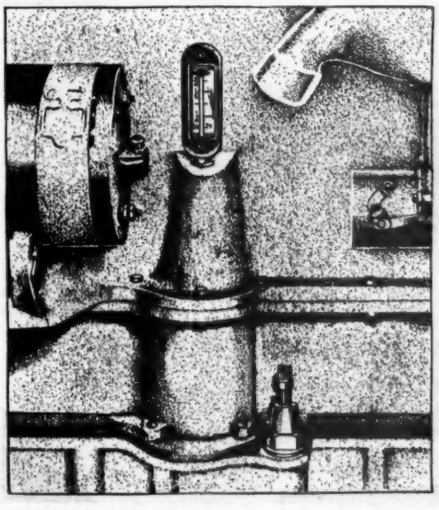
Several of the 1922 cars have made changes in the mounting of the valve tappets. On the Haynes 75 the valve followers are mushroom type, and these, together with the tappet guides, are mounted in assemblies of four, held in position by two cap screws. This gives an accessible layout because by removing the cap screws the entire assembly can be lifted from the engine.

The majority of 1922 cars are using detachable cylinder heads, several who have previously adhered to the integral cylinder head, having changed over this year. One of these is the four-cylinder Buick. The Haynes model 75 uses a detachable cylinder head which is divided to prevent warping and misalignment.

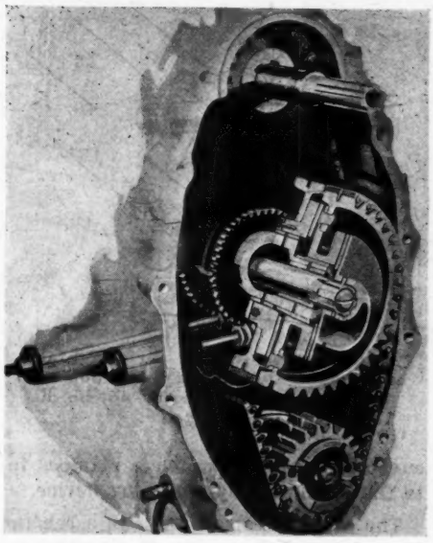
The new Dusenberg has a detachable cylinder head and the vertical driveshaft for the hollow camshaft is made in two pieces so that the head can be removed and replaced without changing the valve timeing. The driving lugs on the vertical shaft is offset so that the head can be replaced in only one way. The oil filler and gage are combined with the breather pipe in this car on the left rear of the engine. The breather has a hinged cap for oil filling and upon the front of the breather pipe is the oil indicator gage.

Overhead Valve Engines

On the overhead valve engine, which seems to be becoming more popular each year, the accessibility of valves for grinding is one of the things that has been given a great deal of attention. The Buick six, which has no detachable head,



On the Marmon engine the oil can be drained by turning the knob shown at the bottom of the illustration



Cadillac has made it possible to adjust the chain tension from the outside of the case providing two adjusting members as shown at the left

has valve cages which can be removed and the valve ground in the cage. On the four-cylinder model, where the entire head comes off, there are no separate cages and the valves are seated right in the cylinder head.

On the Wills Sainte Claire, with its solid head, it is stated that it is easier to grind the valves on this particular solid head engine than it is on the detachable head engine because it takes no longer to remove the block from the crankcase than it does to remove the ordinary type of detachable head, because the same number of nuts and cap screws are used. It is also claimed that this makes it possible to thoroughly clean the blocks after the grinding of the valves is completed.

The matter of brake adjustment is something with which the service man has been concerned ever since the inception of cars. Of late there has been quite a gain in the use of the transmission brake. The transmission brake has certain features to recommend it from an engineering standpoint, but these need not be mentioned in an article of this kind. There are many distinct advantages from a service standpoint in the use of the transmission brake.

Where a transmission brake is fitted it is usually the service brake although there are instances of where the emergency brake is placed on the propeller shaft. Probably from a service and maintenance point of view it is better to have the transmission brake operated by the foot pedal. It is more often used and replacement of the lining is a much easier job as compared to the job of lining the brakes when they are placed on the rear wheels.

When it comes to adjusting the brake it is a vastly easier job to adjust a transmission brake than a contracting band brake on the rear wheels. The job of adjusting a transmission brake usually means lifting the floor board and giving a thumb screw one or two turns. Sometimes in place of the thumb screw there are two ordinary hexagon nuts, one forming a lock nut. These easily can be reached with an ordinary open end wrench. The transmission brake does not become so readily covered with mud and water by virture of its better location and this naturally makes for longer life and easier maintenance.

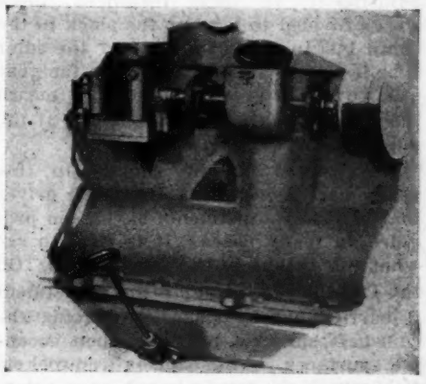
Brake on Transmission Has Advantages

The placing of the brake on the transmission has a further advantage in that it eliminates many parts like operating rods, clevises, poke ends, springs, etc. Thus a common source of rattle is done away with to say nothing of making other parts of the chassis more accessible by the elimination of these parts.

There has been a great deal of attention paid to the location of the brake levers in regards to the spring action of the vehicle. Heretofore, it was not uncommon for a designer to place the brake rocker shafts, that is the shaft supporting the rocker arms between the foot pedal and the brakes, on any convenient cross member. While this very often facilitated production it was not by any means sound engineering.

In such cases when the car traveled over rough roads and there was considerable spring action there was a decided movement of the brake pedal showing that there was a spasmodic application of the brakes which was very undesirable from a driving standpoint. In designing the present day cars the engineers are very careful to get the correct location of the brake operating levers in relation to the spring layout so that any deflection of the springs will not have a resultant reaction on the brake mechanism.

Outside of the increased tendency to use the transmission brake and more attention being given to the location of the brake levers there is not much new in brake construction. On the Templar the brake drum has been reinforced on the outside by a ring swaged to the edge. On some of the new models the brake rods have been removed from the outside of the frame and placed inside where



The accessible oil drain and filler on the new Cleveland

they are less conspicuous when the car is assembled.

Brake adjustment has been made easier in many instances by the Gemmer device which made its appearance about a year ago. By use of this device the brake rods can be taken up without removing the pin in the yoke neds. Several of the cars at the show this year are featuring this device.

A similar device is found on the new Durant. In this case an internally threaded sleeve is screwed over the end of the brake rod. This sleeve is reduced in diameter over part of its length and the reduced portion passes through the eye of an eyebolt whose shank passes through a hole in an arm on the brake pedal. An annular washer and wing nut holds the sleeve in the eye of the eyebolt.

Instrument Board on King and Oldsmobile

To use another illustration of how the motor car designers are bearing in mind the service ability of their cars we might make mention here of the instrument board layout on the King and Oldsmobile. Every service man is well aware of the fact that the average car is greatly lacking in the accessibility of the instruments on the dashboard.

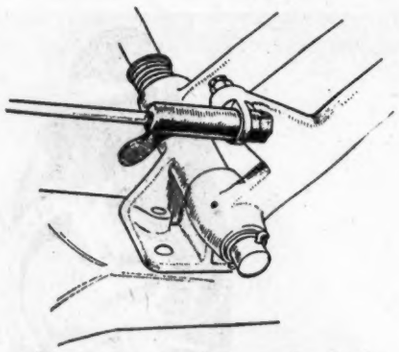
To get around this, King and Oldsmobile have provided their instrument board with a hinged section which, when let down exposes the rear of the instruments so that any of the connections can readily be inspected. On the King, for instance, the instruments thus exposed are the ammeter, ignition switch, lighting switch and dash light. When the cover is down there is also exposed to view the fuses for the various circuits.

There is no doubt but what the future will see more of these installations because among the most difficult jobs to get at are those with regard to the various instruments placed on the dash and especially when not sufficient wire or tubing is provided for their withdrawal.

Chain Drive Adjustment

When chains first came into use for driving the camshaft and engine accessories such as generator, ignition unit, pump, etc., it soon became evident that some means must be provided for their adjustment. In some instances idlers were provided to take up the slack in the chain but in order to set over the idler gear it was necessary to remove the gear case cover. In every instance this meant the removal of the radiator to get at the job.

It is noted on the engines in this year's cars using chain front end drives that exterior adjustments have been provided in many cases. It is easy to see what this means to the service man. On the Cadillac for example the adjustment is carried out by means of placing the camshaft sprocket bearings upon eccentric surfaces. The camshaft sprockets formerly were integral, but now rotate upon the eccentric surfaces located on a



Adjustment provided on the brake rod of the Durant Six. No tools are needed and the rod need not be disconnected

supporting member which is clamped into the crankcase by a locking device.

The camshaft also rotates in a bearing carried in this support. By turning the ececntric surface by means of an adjusting worm the center distances between the crankshaft sprocket and the camshaft sprocket, or between the camshaft sprocket and the fan sprocket are increased thus taking up the play in the chain.

Studebaker Has Exterior Adjustment

On the Studebaker car an exterior adjustment for the front end drive, also, is provided. The chain is tightened by loosening a lock nut on the outside of the gear case and turning down a set screw. This draws the pump shaft sprocket further away from the camshaft and crankshaft sprockets and thus tightens the chain. The pump shaft sprocket has its bearing in the movable plate manipulated by the set screw and therefore must work in unison with the plate.

Haynes has an automatic adjustment whereby the chain tension is kept uniform. Mercer also has an automatic idler adjustment whereby any slackness of the camshaft driving chain is taken up by a spring operated eccentric idler. This adjustment, it is stated, does not need adjustment for 8,000 to 10,000 miles. After this mileage, or in case the front cover of the crankcase should be removed for some reason and it is found that the eccentric has taken up its full action, one link can be removed from the chain. The idler can be brought back to its original position and the chain reassembled.

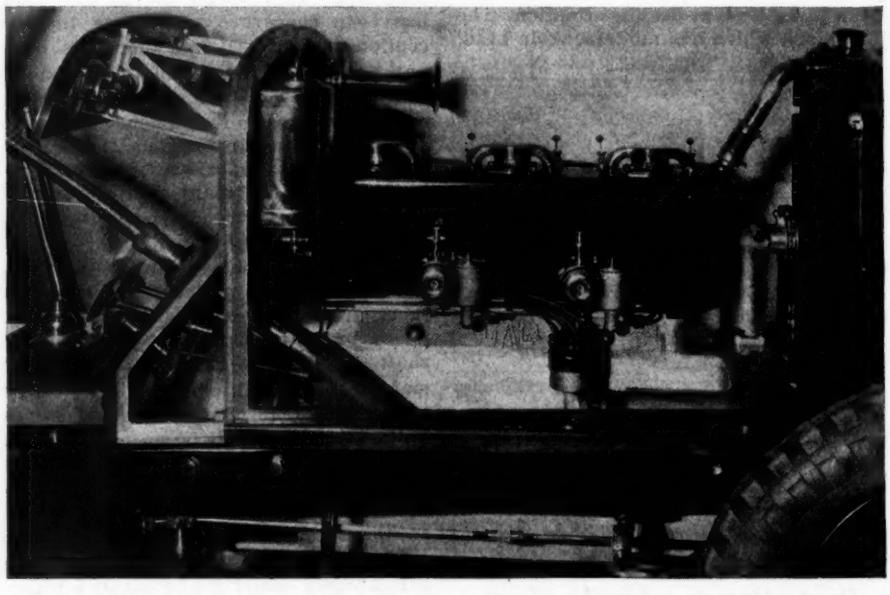
Less Trouble With Fan Drives

There should be less trouble with the fan drives in this year's cars. Many of the makers are using wider fan belts, Doris and Studebaker being examples. In the Apperson and Oldsmobile Eight an unusually wide fan belt is used for driving both the fan and the generator, the fan being mounted on the end of the generator shaft.

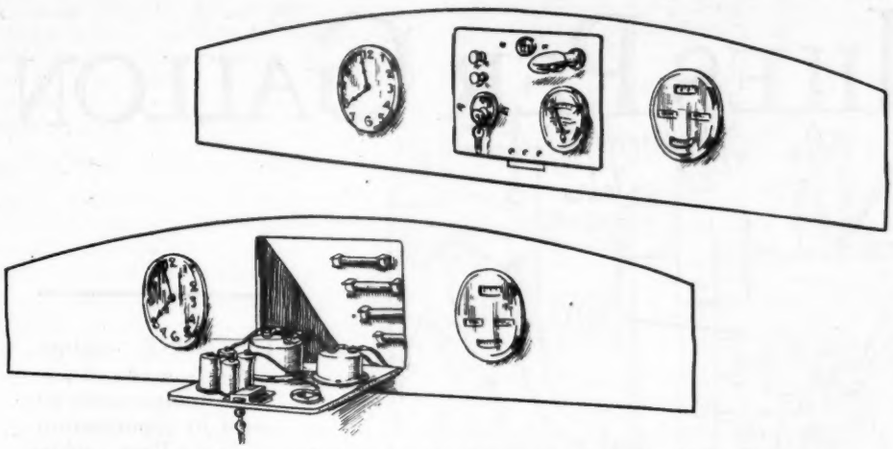
More convenient means are provided in some cases for adjustment of the tension on the fan belt. In the case of the Elgin this can be done without the use of tools by simply turning a wing nut. A spring with wing nut adjustment also is used on the Buick Six while others use a convenient eccentric adjustment.

On the new Leach Six the fan is positively driven by a bevel gear off the vertical shaft which connects the crankshaft with the overhead camshaft. The fan on the Wills Sainte Claire is provided with a clutch arranged to release automatically when the engine speed exceeds a predetermined revolution per minute.

Practically all of the car makers who use semi-elliptic springs undersling these from the axle. This is due in the main because there has been a desire to get lower spring suspensions which naturally lowers the frame of the chassis. There is a distinct advantage from the service standpoint in underslinging the springs. In case a spring has to be replaced it becomes quite an easy matter



While this is not an American car it shows how accessible a powerplant can be made. The instrument board swings down for convenience in making inspections or repairs on instruments



The King Eight has a small door on the instrument board, which when swung down exposes the rear of the instruments and also the fuse block

to simply drop it after the shackle bolts have been removed and the nuts removed from the clips. With the spring above the axle the former often has to be shifted around considerably before it can be removed.

Progress in Mounting Power Plants

Considerable progress has been made in mounting power plants so they can more easily be removed from the car frame. Heretofore it has been quite a job to take out an engine chiefly because the holding down arms extended too far into the side rails of the frame. It also was quite a job to take out the bolts because they were so hard to get at. When you add to this the fact that a cotter pin generally had to be inserted in the bolt and nut it is easy to see that the job was not an easy one when there was little chance to see what one was doing.

There is a tendency now to mount the power plant on brackets which are attached to the side rails. This makes possible shorter arms on the crankcase and, also, brings the holding down bolts further toward the center of the car where they easily can be reached.

There is a great deal to be said this year on the improvement made in carburetion and fuel handling. While on the face of it this may not seem to be primarily a service problem, it becomes decidedly so when we stop to consider that the correct handling of the present day fuel has much to do with engine life and engine life is the thing with which service departments of automobile dealers have had to struggle ever since they have been in business.

Engine life is shortened considerable when poor lubrication is in evidence. And, poor lubrication is not a question only of an efficient oiling system. It means carburetion as well. Take the matter of crankcase oil dilution by raw gasoline seeping past the rings and into the oil.

Oil soon loses its lubricating value when all the gasoline entering the engine is not completely vaporized, especially in cold weather when there is an excessive use of the choke.

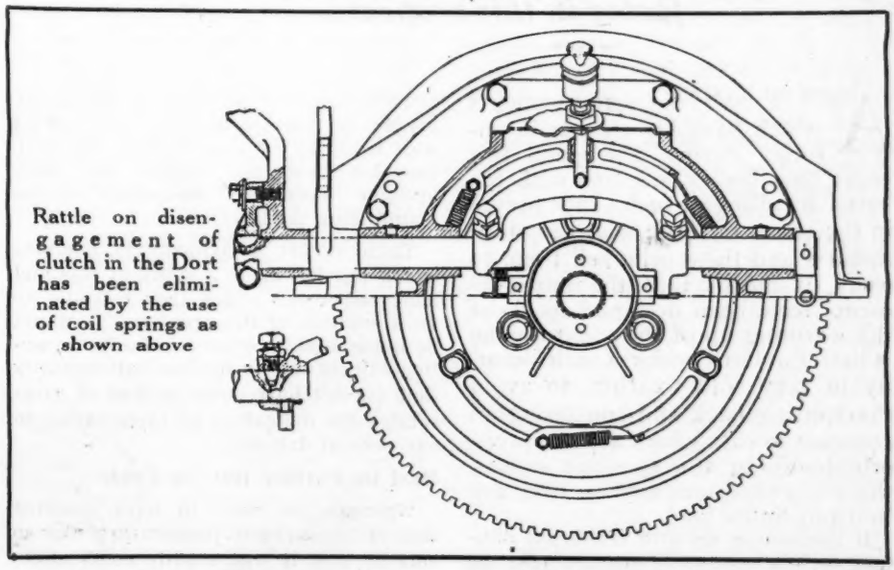
The engine makers long have seen this problem and the results of their efforts are manifested in the excellent provisions made on most engines to handle the fuel. Every new engine which has come out in the past year has some form of hot-spotting device. This is gone into at length in the article entitled, "Getting More Miles Per Gallon," in another part of this issue.

Better Lubricating and Carbureting

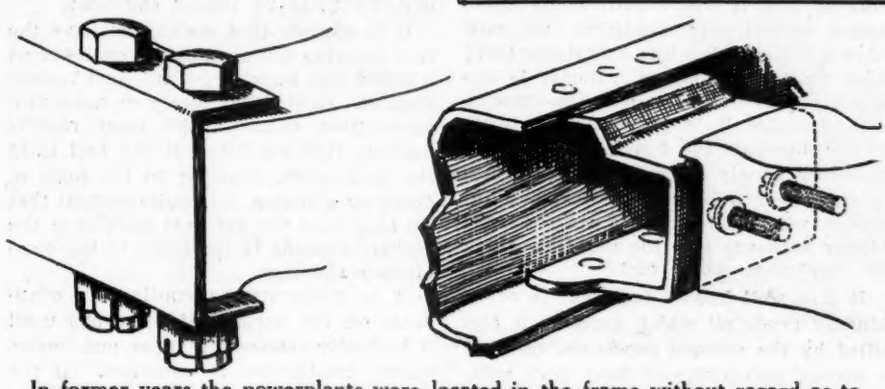
Suffice it to say here that the better provisions for lubricating engines and carbureting the fuel more completely is going to have a direct result on the prolonging of engine life and incidentally make the job easier for the service. Some of the problems in service traceable to poor fuel handling have been hard at times to find, but the laboratories of our factories have been very busy the last few years and done much to practically solve them.

The same is true of cooling and temperature control. In many cases the water passages in the blocks have been made larger and the "Siamese" method of casting cylinder blocks, especially in the smaller sizes, has given way to the method wherein water completely surrounds each cylinder. This does away with the chance for warping blocks and resultant bad action of the pistons. Warped blocks, "oil pumping," etc., have worried many service men in the past, but this year's engines should be practically immune, generally speaking, from this trouble.

The past year also has seen some improvements in foundry practice, whereby it is possible to get castings of a higher grade. Heat treating methods and machine operations have been brought to a higher state of efficiency also.



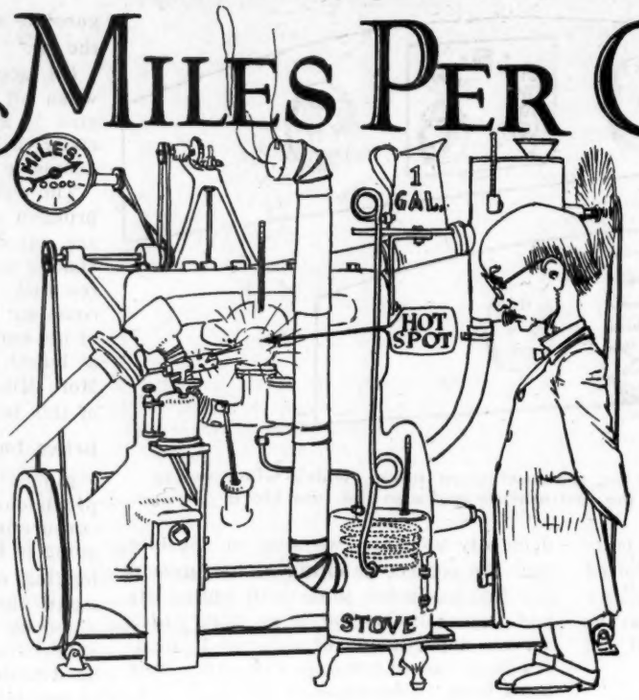
Rattle on disengagement of clutch in the Dort has been eliminated by the use of coil springs as shown above



In former years the powerplants were located in the frame without regard as to their ready removal. Today's tendency is for shorter engine arms and consequent easier removal

MORE MILES PER GALLON

PRESENT day gasoline extremely difficult to get into gaseous state, although containing more heat units per unit of volume



IN MOST engines use is made of exhaust temperature to assist in vaporization of fuel. Best carbureter vaporizes but partially

THE last two years have seen much work in the way of developing hot spot devices and better fuel passages. Crankcase oil dilution by raw fuel has been big factor in this respect.

ABOUT half the improvements which have been made in engines during the past few years have been concerned with the better handling of fuel. Interpreted in the terms of those who use automobiles and those who sell them to users, it means that the improvements have been designed to assist the warming up of the car, to make it better able to perform satisfactorily in very cold weather, to avoid the spitting back and sputtering so common to cars which are not properly handling the gasoline during the winter mornings when they are first put under load.

It has also to do with crankcase dilution, or, the leakage of gasoline into the crankcase, thus spoiling the lubricating qualities of the oil. It affects the ability to accelerate, to climb hills, to get good mileage out of a gallon of gasoline, to operate satisfactorily at extreme low speeds on high gear, and all that is meant by responsiveness to the throttle. An automobile engine which is handling the gasoline properly and efficiently is a delight to drive. One that does not do so is just the opposite.

We have been hearing about hot-spot manifolds for nearly ten years and a great many engineers are ready to admit that they do not know much more now than they did at that time. It is a fact, however, that in spite of the greatly inferior grade of fuel from a vaporizing standpoint, we are burning this fuel as well today as we ever burned any fuel, provided that the engine has been brought thoroughly up-to-date in its manifolding methods.

There is not a company in business which has not made a study of this and done something which they consider to be a solution of the problem. It would be impossible, in other words, for an automobile engine to operate satisfactorily that did not have some method of overcoming the difficulties of vaporization in our present-day fuel.

Must Go Further Into the Crude

Whereas, we used to have gasoline that at atmospheric temperature was so volatile that it was readily combustible under almost any condition, we now have a fuel which, while containing more heat units per unit of volume, is extremely difficult to get into the gaseous state because it is necessary, in order to accommodate the demand for the tremendous supply of gasoline necessary, to cut lower into the crude oil and includes what were once known as the higher kerosene into the gasoline which we employ as motor fuel.

It is a well known fact that in every kind of crude oil which gasoline is distilled by the various processes, there is a certain percentage of light, very volatile content which is readily distilled off. If we were to only take this small fraction, we would not by any means fulfill the demand for motor fuel. In order to get the desired volume of motor fuel, we must go further into the crude than this and distill off down to products which remain liquids at high temperature.

It is easy to see that in winter time when cold weather is the rule that these constituents which do not really boil are apt to remain in a liquid state unless some artificial heat is applied.

In the gasoline engine we make use of the exhaust temperature to assist in the vaporization of the fuel. For a long time it was only necessary to use the temperature which was contained in the cooling water circulating around the jacket. This cooling water, which runs at a temperature averaging about 180 deg. Fahr., is no longer sufficient.

It is obvious that we cannot have the fuel entering the combustion chamber as a liquid and hope to get the best results from it. In the first place, we need in a combustion chamber the most rapidly burning fuel possible. If the fuel is in the combustion chamber in the form of drops or globules, it is quite evident that we only have the external surface of the globule exposed to the flame in the combustion chamber.

It is necessary to continually evaporate off the surface of the drops until it is finally reduced to vapor and burns, before combustion is complete. If the fuel were in the combustion chamber in the form of a gas, there would be no

insulating volume between the surface and the interior as there is in a globule and consequently conditions would be ripe for the quickest possible combustion and, consequently, the most efficient performance of the engine.

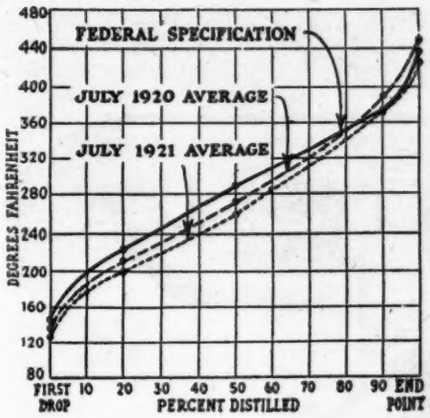
Gasoline Only Partially Vaporized

Even with the best carbureter it is possible to obtain, the gasoline is only partially vaporized. It comes into the intake manifold in the form of a mixture of fog, vapor and globules or drops which vary in size from very minute up to quite an appreciable diameter. It would be possible, with the application of an abundance of heat, of quickly vaporizing all of this fuel and transforming it into practically a gas for the combustion chamber, but there is an objection to doing this.

As the charge is heated it is expanded. In other words, when the heat is applied the charge is rarified, it becomes less dense. To put it in another way, there are fewer heat units in a given volume because there is less fuel in a given volume because of the expansion. Thus, it is quite evident that if we overheat the incoming charge, we are cutting down on the efficiency of the engine in another way. We are not allowing the combustion chamber to secure as many heat units as it should.

Heat Liquid Fuel Only

Intake manifolds are now being designed so as to apply just the amount of heat necessary to vaporize the last drop or globule. They are being designed so that the heat will only be applied to the liquid fuel and not to that which has already been vaporized. There are many ingenious methods for securing this result. These methods may be classified into two main groups—one, in which the inertia of the incoming charge is taken advantage of and the other in which there is a settling chamber for the liquid fuel.



Here is shown a chart issued by the Bureau of Mines. It shows the per cent of motor gasoline distilled at different temperatures. It will be noted that the heavier products require a higher temperature to distill them and as the carbureter has to produce a vapor exactly as in the process of distillation, therefore carburetion is now more difficult. July specifications are always lower than those for January

Considering first the type which utilizes the inertia of the incoming charge, it is quite evident that there is more inertia in the heavy liquid particles in the fuel than there is in the gasified portion. If the manifold is so designed that the liquid globules through their inertia are allowed to impinge on a hot plate while the gasified or vaporous portion go on their way without coming into contact with the heated spot, the object is fulfilled. This forms the basis of a number of designs of hot-spot.

The other fundamental characteristic of hot-spot is the settling chamber in which the heavier particles due to their weight, are allowed to settle into a receptacle which is heated, while the gaseous portions go on their way in suspension in the intake pipe. This forms the basis of another series of hot-spots. There is another consideration, however, which must be taken into account in designing a hot-spot and this is also given attention in a great majority of intake manifolds.

Methods for Removing Wet Fuel From Intake Manifold

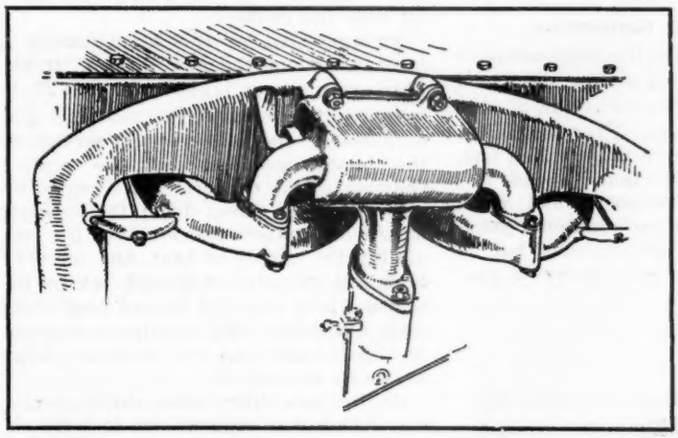
This last consideration is the tendency of the wet fuel, or the unvaporized portions, to creep along the wall of the intake manifold. The liquid clings to the dry wall of the manifold very tenaciously, and in order to tear it free, all sorts of schemes have been suggested. The most general method is to give the intake manifold a shape so that the internal wall will be led up to an edge from which the wet fuel will be wiped by the incoming flow of mixture. This proved to be very effective.

Another method is to use a hot ring which completely surrounds the intake manifold and vaporizes all of the fuel which is creeping around the wall and which attempts to pass the ring. In other words, the hot ring forms a guardian by which no liquid is allowed to pass.

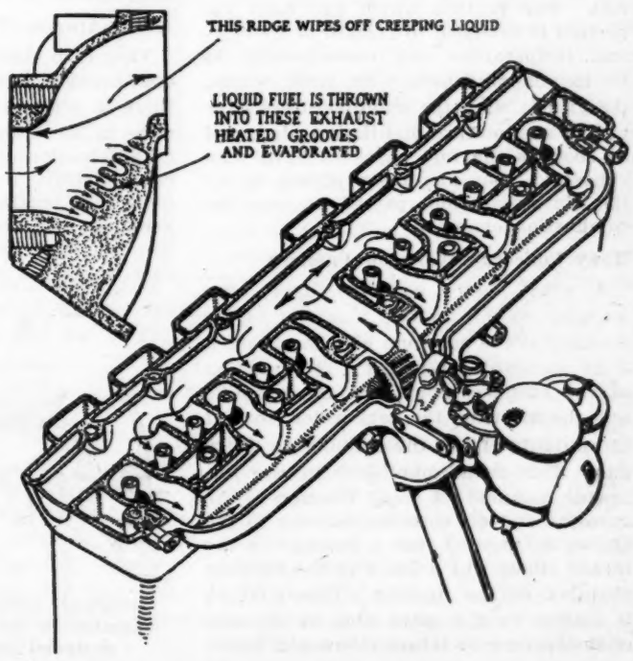
Ansted Hot-Spot

In pointing out a few of the hot-spots which have been developed during the year and which are now in use in various cars, the fundamental purpose behind the design will be appreciated by an understanding of the explanations which have been given. One of the interesting hot-spots of recent development is incorporated in the Ansted engine. In this system the incoming air is not heated at all. Thus, nothing is done to rarify the charge by super-heating the air intake. The heat is not applied until after the mixture leaves the carbureter.

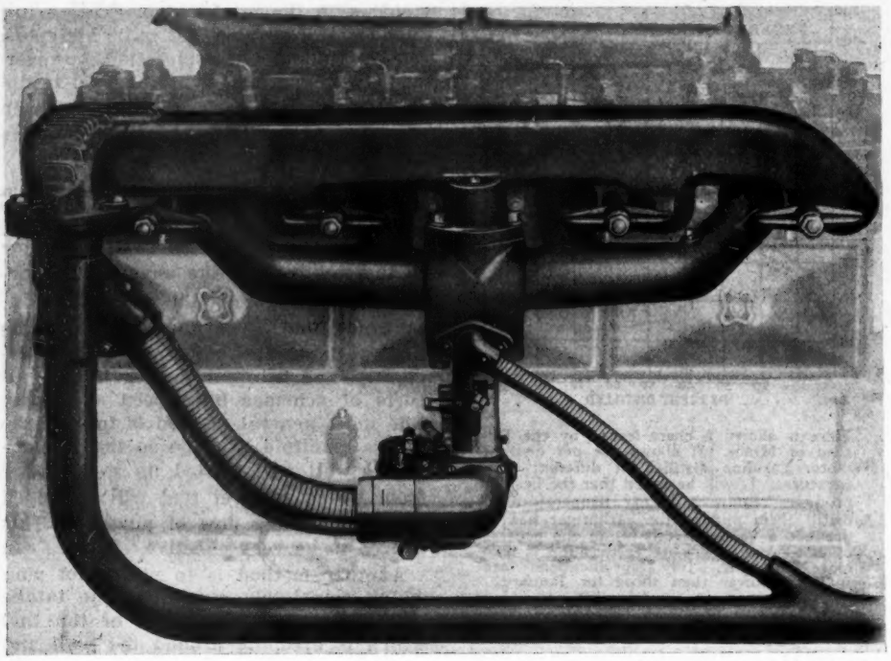
The device which the manufacturers



The hot spot arrangement used on the new G. M. C. truck is a combination manifold and carbureter with dampers for regulating the supply of heat



In the Ansted engine use is made of the corrugating device in the hot spot arrangement where the fuel enters, the grid being heated by the exhaust. The bend in the ridge of the intake wipes off any creeping liquid



This shows the new manifolding arrangement used on the latest Haynes engine, the model 75. It will be noted that part of the exhaust heat is shunted around the intake and is controlled by a damper

call the Lexi-Gasifier is on page 27 In the intake manifold there is placed a grid or deeply corrugated surface just at the point in which the charge enters the cylinder head. This grid is exposed on its reverse side to the heat of the exhaust, which is led behind it. The grid is in such a position that it is directly opposite the incoming stream, so that any heavy particles entering with the charge are thrown, by their own inertia, onto the surface of this grid.

Any portion of the charge which is creeping along the wall is wiped from a ridge caused by a bench in the intake, as shown in illustration. The purpose of this device is to only heat the liquid fuel. The portion which has been vaporized is intended to remain at its original temperature and, consequently, at its maximum density. In other words, the grid is what the manufacturers have named a miniature distillation plan, and as soon as the fuel particles have been vaporized, they are again picked up by the air stream and passed on into the combustion chamber.

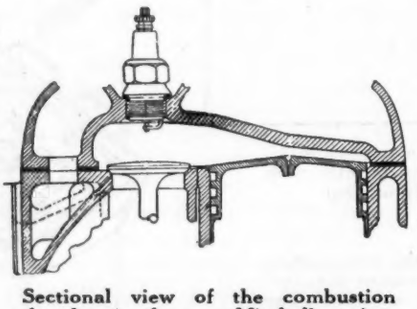
Many Concerns Work on Fuelizer

A great many concerns have been working on the fuelizer idea, but so far Packard is the only one who has adopted it as standard equipment. The function of the fuelizer is to heat the gasoline and the air from the carbureter, so that the mixture enters the cylinder as a dry gas. This is accomplished in the following manner: A small fraction of the gasoline and air mixture passing to the engine is shunted into a passage in the intake elbow which leads to the burning chamber of the fuelizer. This mixture is ignited by the spark plug in the side of the fuelizer or intake elbow and burns with a steady flame which can be viewed through the inspection glass on top of the fuelizer.

The flame heats the manifold metal and then the burned gas mixes with the charge going to the engine from the carbureter. This wet mixture is thereby changed to a dry gas. The color and condition of the flame is an index to the operation of the fuelizer. A steady bluish green flame indicates a good mixture. The Packard company claims that with the fuelizer, it is possible even in cold weather, to operate the car with the choke adjustment set at normal running position within 20 to 30 seconds after the motor is started.

A "Re-Atomizer" for Carburetion

They also claim that the acceleration is considerably increased at low speed and there is practically no collection of gasoline in the crankcase. They also claim an elimination of spark plug fouling and, consequently, a reduction in the frequency of carbon removing and valve grinding. No claim for additional gasoline economy is made, except that in cold weather a somewhat increased gasoline mileage may be noted with the fuelizer in operation.



Sectional view of the combustion chamber in the new Mitchell engine, designed for present day fuel

The Penberthy Injector Co., which manufactures the Ball & Ball carbureter, during the early part of the year brought out what they called the re-atomizer. This device is placed between the carbureter and the manifold. It comprises a spacer into which is pressed a venturi throat carrying four small tubes. The spacer contains a passage-way of the same diameter as the intake manifold.

Vapor Condenses When Striking Parts

The basis upon which this device is designed is that with the grade of gasoline sold today, it is extremely difficult to vaporize completely, and even when the vapor has been made, it is easily condensed by striking obstacles to its free passage. The butterfly valve used in all carbureters, when only partly open, presents such an obstacle. As the vapor strikes this butterfly valve, a considerable percentage of it is condensed and thrown against one wall of the carbureter, and some passes up the wall of the manifold in a liquid form and cannot, consequently, be equally divided between the various cylinders.

Around the lower outside edge of the re-atomizer is a groove or annulus which forms a small circular chamber between the inside of the spacer and the outside of the re-atomizer. The ejector effect of air flowing by a tube extending into the air stream in the direction of flow of the air is very well known. This principle is the basic idea of this re-atomizer.

The ejector effect on the four tubes which extend into the throat tends to draw into the annulus any liquid gasoline which may be passing up the wall of the carbureter and to eject it from the tube in an atomized condition, so that it flows in the air stream and goes equally to the different cylinders. While this device is not incorporated as standard equipment on any car, it has been installed at service stations very widely all over the country.

An interested hot-spot arrangement is incorporated on the new G. M. C. truck. This arrangement is shown on page 27. It is in reality a combination manifold and carbureter. Both the vertical section of the intake manifold and the venturi chamber of the carbureter are heated by exhaust gases direct from the exhaust manifold. Dampers are provided for regulating the supply of heat, and for very high, hot climates, a gasket can be inserted which cuts out the exhaust jacketing altogether. This is slipped between the carbureter and the exhaust outlet shown in the sketch.

On the new Oldsmobile eight-cylinder car, which was brought out last March, it is very interesting to note the construction of the intake manifold. This is one of the year's new cars and consequently may be regarded as fully up-to-date in practice. In this car, the intake manifold is integral with the cylinder block.

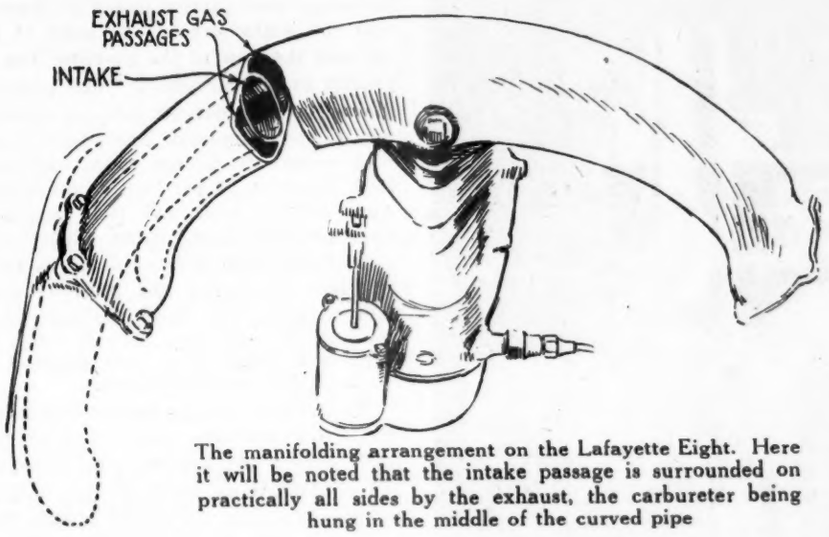
Considerable study has been given to gas distribution, the intake being nota-

ble for the absence of abrupt bends. This intake manifold is 1 9/32 in. in diameter, in spite of the fact that the cylinders are only 2⅞ in. bore. The exhaust passages are in line with the intake, sweeping around in an easy curve and allowing the exhaust to be carried away through a manifold bolted on top of the cylinder head.

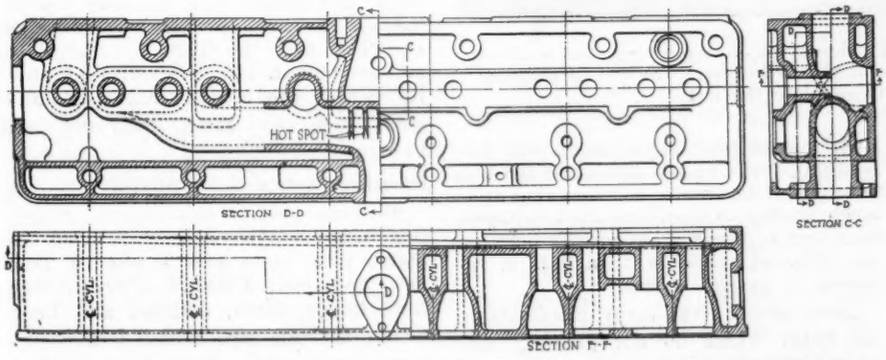
Oldsmobile Carburetion Cited

The exhaust passages lie directly over and cross the intake passages, thus heating the intake. Cooling water circulates all around the cylinder bores, and also around the intake and exhaust manifolds.

Some of the exhaust gas passes through this jacket and enters the exhaust pipe at a point near the rear end of the engine. A damper, by means of which the temperature can be controlled, is provided. This damper regulates the amount of exhaust gas which enters the jacket. In addition to this provision, all of the air which enters the carbureter is preheated by means of a stove clamped around the exhaust pipe at a point just below its connection with the manifold. There is a sleeve adjustment on this air intake which permits of admitting cold air at this point when desired. This admission of cold air in an arrangement



The manifolding arrangement on the Lafayette Eight. Here it will be noted that the intake passage is surrounded on practically all sides by the exhaust, the carbureter being hung in the middle of the curved pipe



The sectional view of the Velie cylinder head. This shows the hot spot directly opposite the opening for the carbureter. The gas distribution is said to work out very well in this design

In this design it can be seen that precautions have been taken to complete the vaporization within the manifold and also to prevent recondensation through the intake gases striking cold spots after they have entered the intake ports.

On the new Haynes engine, which was brought out this fall, a number of innovations have been made in the manifolding to facilitate vaporization of the fuel. The exhaust manifold is led forward on this power plant and cooling fins are placed upon it at its forward end where it bends downward. The center of the intake manifold is partially exhaust jacketed.

where all of the air can be preheated is very important, in view of the fact that it is necessary not to get the mixture too hot.

Duesenberg Hot-Spot

It may be mentioned as a matter of interest that several concerns have found it necessary to cut down the amount of heat provided by the exhaust. The Marmon company reduced the temperature and a similar reduction was made in the Continental hot-spot. The Haynes vaporizing arrangement is shown on the opposite page.

On the new Duesenberg-eight-in-line car an ingenious form of hot-spot is employed. The carbureter is located on the right side of the engine, the gas flow being vertically upward to a hot-spot contact with the exhaust manifold, which is located on this side of the block. From this point, the gas is taken through a straight passage between the two center cylinders across the block to the left side of the engine, where it enters the aluminum intake manifold, which is of ramshorn design.

The ramshorn type of manifold is found in the Chalmers, which is one of the originators of this type of manifold, and also in the new Rickenbacker car, which will be exhibited at the shows. The ramshorn type of manifold has a central hot-spot with the typical ramshorn curve which is symmetrical and has an upward and then a downward bend on each side.

Hudson Changes to Get Better Vaporization

On the new Hudson car, the changes which were made in the engine were particularly intended to secure better vaporization. The change was in the air intake and manifolding. Previously, Hudson used cold air. But on the cars since about the first of September, 1921, all of the air is preheated. Globe elbow joints are used to give a large sectional area to the piping at the turns and at the entrance of the carbureter. The air is heated in a stove which is integral with the exhaust manifold on the right side of the engine, and is led over the top of the engine to the carbureter, on the opposite side.

The carbureter is attached to a vertical flange at about the center of the block. The air pressure at the carbureter inlet is balanced with that in the float chamber by a compensating tube, which connects the float chamber with the air intake. This is said to conserve gasoline on quick throttle openings.

The manifolding has also been altered internally so that a modified form of hot-spot is provided between cylinders 1 and 2 and 5 and 6. The intake manifold at these two points is brought into close proximity with the exhaust. Liquid fuel which collects in the pockets aids materially in shortening the warming up period. This same air intake system and manifolding is now used on the Essex car also.

Cadillac Thermostatic Control

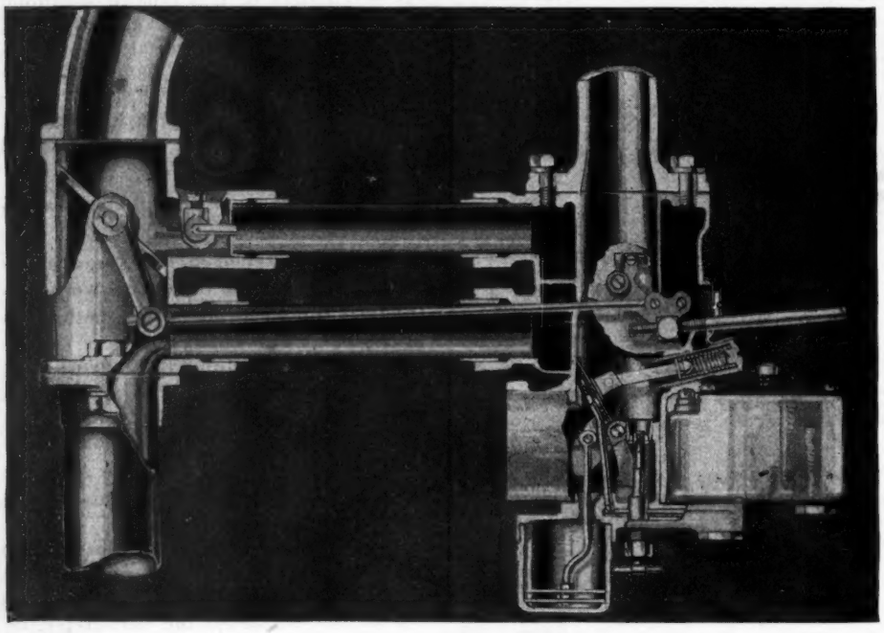
An interesting development has been made in the new Cadillac in the carbureter. This is now provided with thermostatic control for the tension on the auxiliary air valve spring and also for regulating the effectiveness of the accelerating pump, which is a feature of the Cadillac carbureter.

The manual setting for the air valve is employed as usual, but super-imposed on this manual setting is a thermostat which

alters the tension on the air valve spring in accordance with temperature requirements. On the cold engine, the spring tension is increased, thereby causing increased resistance to the opening of the auxiliary air valve, in warmer weather the effect is the reverse, thus tending to make the mixture leaner.

Thermostat on Accelerator Pump

The thermostat on the accelerator pump, which is located in the fuel chamber, operates a shutter which covers and uncovers a vent, thus increasing the effectiveness of the pump when the engine is cold, and decreasing it when the engine is warm. In other words, when the vent is open, the accelerator pump has little or no effect, but when it is closed, the accelerator pump or throttle pump will force gasoline through the spray nozzle when the throttle is opened quickly for acceleration. When the throttle is opened slowly, the pump has practically no effect on the gasoline.



Buick Four fuel heating arrangement. This shows the winter setting that is all of the heat from the exhaust is carried around the carbureter, whereas in summer the butterfly is open to regulate the heat

The throttle pump is interconnected with the throttle and its function is to force compressed air into the float bowl. When the thermostat comes into effect and opens the vent, the air, of course, cannot be compressed and consequently the pump operation is materially reduced. It is claimed that the introduction of these two thermostats materially reduces the warming up period of the engine.

On the new Buick four, which was brought out in August, 1921, the fact that less heat is needed at high speed than at low speed has been recognized and a damper is provided which controls the exhaust heat. This is interconnected with the throttle so as to give more heat at low and less heat at high speeds. This is an internally hot-spotted manifold, the intake manifold being cast integrally with the detachable head.

These scattered examples will illustrate what different manufacturers are doing to assist in vaporization. As stated at the beginning of this article, everybody is doing something along these lines. It has been realized that a great deal of the so-called pumping of oil and crankcase dilution which means that the fuel is getting down into the crankcase and is just the opposite from the oil pumping where the crankcase oil is getting into the combustion chamber, has been due to poor vaporization and distribution. The two problems go hand in hand, as it is readily realized that it is much harder to distribute fuel in liquid form and to break it up equally between the different cylinders, than it is in vaporous or gaseous forms.

There are a great many manifolds in use today which do not properly distribute charges. It is easy to determine this by running the engine at high speed with the exhaust manifold removed and note the different colors of the exhaust flame. They will range all the way from blue to a dull yellowish or reddish tinge. These colors indicate very closely the nature of the combustion and are very instructive from a distribution standpoint. Quite often it will be found that the colors will change materially and the relationship varies through a wide range on different throttle openings.

A fact which must be recognized is that the best hot-spot in the world will not assist the engine in getting started. It will shorten the warming up period of the engine, but it will not cause the first few explosions which are so important on a cold winter morning. To secure these it is necessary that a good priming or choking device is used. The electric primer has proven quite successful in a number of instances and is regularly employed on Franklin, Lincoln, and others. The Master primer, which is manufactured and put out now by the Splitdorf Co. has had a wide sale and is used as standard equipment on some cars.

Regarding the actual method of carrying fuel from the gasoline tank to the carbureter, it may be mentioned that the vacuum feed retains this ascendancy.

Fuel Tanks and Fuel Feeds

In the very early stages of development of the automobile, practically all the tanks were carried under the driver's seat or somewhere in the body of the car and the flow of the gasoline was by gravity to the carbureter. The pressure system was introduced early in the history of the automobile and gained headway, especially in the more expensive cars. In 1911, 81 per cent of all models were gravity feed and the remainder were pressure feed. Some experiments were made with several different combinations of gravity and pressure from 1914 to 1917, but these systems never got very far and were entirely given up after 1917. They were only adopted by three or four manufacturers.

The present vacuum system was introduced for the first time in 1915 and made very rapid headway, being standard equipment on about 20 per cent of the cars made for the season of 1915. The next year showed a jump to 53 per cent, each succeeding year showing an increase. In 1921 88 per cent were so equipped and the 1922 percentage is slightly higher. The cars using the gravity system are largely high production jobs such as Ford, Overland and Chevrolet.

Pressure System Gains Slightly

Pressure system has gained slightly this year in that several cars in the higher price class have adopted it, Daniels, Lafayette, Packard, Pierce-Arrow, Rolls-Royce, Stutz, Cadillac and Locomobile use this type of fuel feed.

The gravity system has been so largely displaced for two reasons. In the first place, the bodies of cars have been getting lower and lower and the room occupied by the tank under the seat has been required for other purposes. The inconvenience in filling such a tank has been another feature that has caused its decline. Some makers have resorted to the plan of placing the gasoline tank in the cowl, filling from one side and feeding direct to the carbureter.

In the second place, the gravity tank is always at a disadvantage in climbing a steep hill with the tank only partially full. The vacuum and pressure system do not have this advantage. The development of the vacuum tank has been very successful, both mechanically and from a price standpoint, and this has no doubt accounted for its great growth.

DESIGN *in* POWERPLANTS IMPROVED

Better Lubrication, Cooling and Carburetion in Evidence. More Attention Being Paid to Light Reciprocating Parts. Engines Mounted More Accessible

THERE are many details of refinement on the 1922 cars and engines which are the results largely of better production methods and a putting into actual practice much of the vast amount of information obtained by the engineers of the industry during the war.

Much of the practices in aircraft engines, for example, have been incorporated in a modified form into the automobile engines of today and the result is that we have, generally speaking, much more efficient engines for their size than ever before.

The designs of engine parts are better and the methods of machining them are better. The result is that the dealer of today has a product full of good selling points if he will stop to analyze it. Many of the things which a few years ago it was said could not be done are being done. It was thought that the aluminum piston, for instance, never would get very far.

Yet, today the aluminum piston is working out with satisfaction in a number of cases. The fact of the matter is that our engineers have found out many things about the alloy pistons in the last two years, after the laboratories had sufficient time to get down to a peace time basis.

Probably as much development has been done on pistons as on any other unit of the engine. Gray iron pistons or semi-steel pistons still are used by the majority of engine makers, but there has been a tendency in the past year for some makers to go to the alloy piston of what is known as the constant clearance type. Briefly, this is a piston which does not expand in the same way as we think of piston expansion in an iron piston. Usually there is cut in the piston, so that when the piston does expand it simply closes this cut and does not, therefore, change its diameter. Hence the clearance substantially remains the same in all cases. Where the constant clearance type of piston is used it generally is made with an opening extending circumferentially around the piston excepting for a small portion where the piston pin bosses are located. The object of this slot is to separate the upper portion of the piston or heat portion, from the slipper or portion of the skirt.

Iron and Semi-Steel Piston Very Light

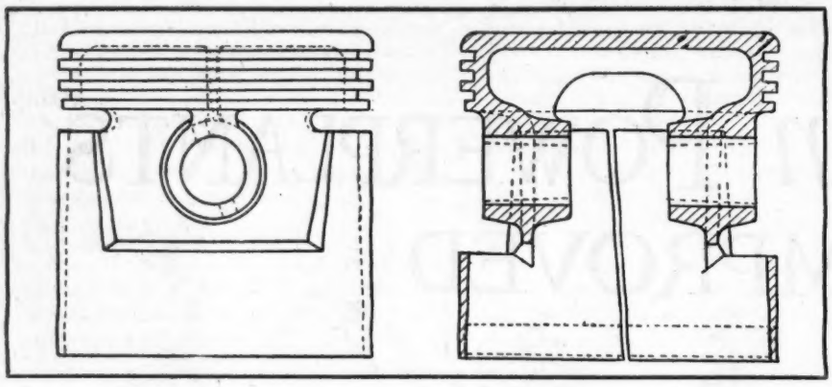
Where iron or semi-steel pistons are used there has been a tendency to get them very light. In fact some of the semi-steel pistons weigh very little more than aluminum-alloy pistons. It is possible to take some of the lightweight iron pistons and squeeze them into an egg shape by hand. Flexible pistons like this have the advantage that they will shape themselves into the cylinder bores in which they are working. In other words, the pistons will conform much better to the shape of the cylinder, should the latter wear oval.

One of the things in favor of the semi-steel piston is that owing to the nature of the metal it can be machined to much closer limits than with cast iron. There is, therefore, obtained also a reduction in weight, a desirable feature in any of the reciprocating parts of an engine.

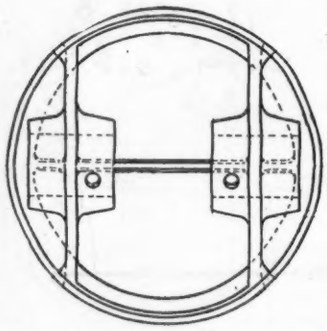
A very good example of the constant clearance type of piston is that used in the Cole Eight. These pistons are cast in a metal mold of aluminum alloy and are slotted circumferentially below the lowest of the three piston rings above the piston pin. The slot is cut by a 1/16 in. saw and extends over an arc of 83 deg. on each of the two pressure sides of the piston. By means of central ribs the load due to the gas pressure is transferred directly from the piston head to

Engines In This Year's Cars Best Ever Built

THERE is every reason to believe that the engines in this year's cars should give a better account of themselves than any engines which thus far have been produced. Better design, materials, production methods and other factors have entered into the building of present day engines, and with improvements throughout the chassis it is certain the powerplants will be performing under the best possible conditions.



Sectional view of the Maxwell lightweight piston, which is of the constant clearance tvpe. It also is of the modified slipper type. The vertical slot takes up the expansion of the piston under heat



the piston bosses. The pistons are a snug fit in the cylinder, even when cold. There is, therefore, no undue noise in the engine when first starting up.

A piston recently adopted by Essex is also of the constant clearance type and the layout for the making of this piston has been arranged in the belief that piston wear, oil pumping and failure of the piston rings to make proper contact with the cylinder walls is due largely to misalignment. This misalignment causes the piston to cock in the cylinder so that one side of it becomes a scraper giving unequal lubrication around the walls. The skirt of the piston is split with a slot cut at an angle so that it does not work vertically in the cylinder, but with a sliding motion. Part of the piston and rod assembly operation is such that a final check is made on the alignment of the piston and makes it certain that the latter will operate on a true axis.

Method of Checking Alignment

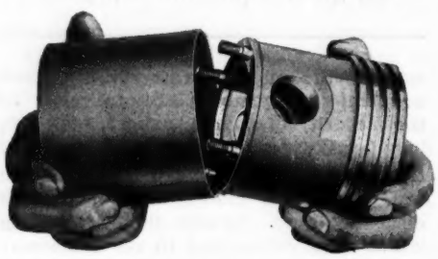
Another example which will illustrate to what extent makers are going to insure the pistons working absolutely parallel with the bores is the method of checking alignment of the piston and rod in the Rickenbacker engine. If a connecting rod is found to be slightly bent, instead of its being bent to shape cold, it is faced off in a special fixture by grinding. This will insure no stresses being set up in the rod when it is heated while the engine is operating. Thus there is assurance that the pistons will at all times work correctly in the bores.

Most makers of engines are now polishing the heads of the pistons. It is well known that carbon or soot will not so readily adhere to a polished surface and while it becomes somewhat more expensive to finish pistons in this manner, it is worth it in the better appearance of the engine and the resultant effect on the car owner.

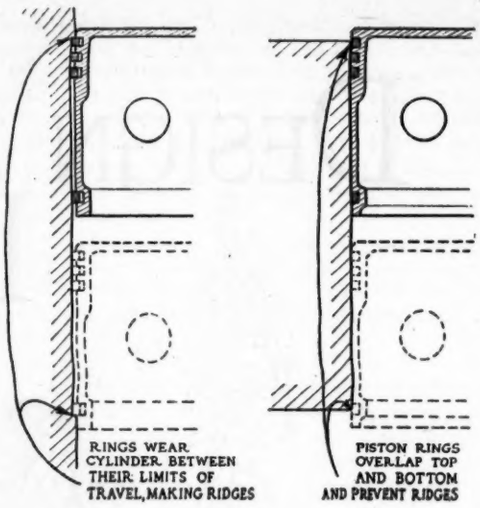
There also is a tendency to make pistons a little longer than in former years, which no doubt adds to the life of the piston itself, and the walls as well. A long piston is less apt to cock in the cylinder and there also is a better distribution of the load on the cylinder walls, because the load is taken on a larger area. This, with a good oil film and the better quality of materials used naturally makes an engine much longer lived.

Much attention, too, has been devoted to the ribbing on the inside of the pistons. The purpose of these ribs is to distribute the load imposed upon the head of the piston by the explosion and also to radiate heat through the piston and into the crankcase. There is, of course, the additional advantage of ribbing over the piston pin bosses and thereby producing a cross-head type of piston.

The Cole, Essex and Maxwell pistons offer examples of the cross-head type. In connection with pistons it might be stated here that makers are giving more thought to the accessibility of piston and rod. In several engines it now is possible to withdraw the piston and rod, through the crankcase after the bottom plate has been removed. Naturally it means considerably less tearing down of the engine when repairs may be necessary and is a good point in the selling or servicing of cars so built.



Marmon uses a combination piston. The shell is cast iron and the carrier aluminum alloy


RINGS WEAR CYLINDER BETWEEN THEIR LIMITS OF TRAVEL, MAKING RIDGES
PISTON RINGS OVERLAP TOP AND BOTTOM AND PREVENT RIDGES

This shows how pistons wear rings or shoulders in the bores when they are cocked in the cylinders. Right, how it is possible to overcome this

The connecting rod has come in for a good deal of attention during the last year or so. In nearly every case makers now are finishing their rods much better. Some go so far as to machine the rods all over and take great care in balancing them. Heretofore some makers have weighed their rods and if they were within ½ oz. of each other they passed inspection. These same makers now carefully balance the rotating ends of the rods and the reciprocating ends, because it is of prime importance to get the rotating weights alike and also the reciprocating weights.

Getting Better Distribution

In order to get a better distribution of the load on the connecting rod bearings, many engine makers now are flaring the ends of the connecting rods. This naturally results in such a bearing wearing less, because the load imposed upon it by the explosion stroke is taken over a greater spread, than where the I-beam part of the rod is brought to the cap end in approximately a right angle, or a small fillet.

It probably is in keeping with the scope of this article to mention the aluminum connecting rod. Although this type of rod is not at present used by makers it seems to possess qualities which spells well for its future. Such a rod reduces the inertia loading on the bearings and it would be possible to reduce the bearing lengths considerable, which, in turn, would make the whole engine lighter. Aluminum rods, however, have to be designed on very much different lines than steel rods, just as it is necessary to design aluminum pistons differently than cast iron pistons.

A point which is merely a detail, but which means much to the servicing of engines is the bevelling off of the metal on the lower end of the cylinder bores to facilitate the insertion of the piston with the rings attached. In some cases there is a slight chamfer at this point,

but Wills Saint Claire, for instance, has gone the limit and made quite a pronounced bevel. It is stated that the insertion of pistons and rings on this engine is a very simple matter.

Another kink in connection with the design of this engine is that the top and bottom piston rings slightly overlap the cylinder bore in the top and bottom dead center position. This insures against the piston wearing a shoulder inside the bore. We point out this example simply to again emphasize the fact that the car purchaser of tomorrow is getting a product into which much thought has been given to details, such details which collectively make a good product.

Improvements in Valve Mechanisms

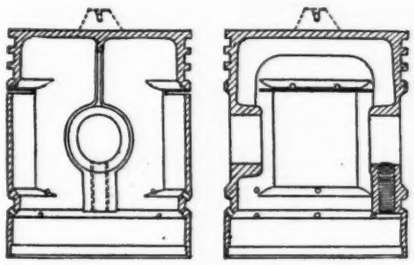
In looking over the progress made by engine makers during the last year or so, mention must be made of the improvements in valve mechanisms. It is true that much has been accomplished in reshaping the valve ports, etc., to get a better flow of gas, but there have been some interesting developments in the valve materials themselves. By careful selection of materials the makers now design intake and exhaust valves which will have but a slight expansion or increase in length due to heat and which will operate well at all times with a very small amount of clearance.

One maker, for instance, is using an exhaust valve made of several different materials, according to the function of each part of the valve. Thus, at the tip of the valve stem, which is subjected to the constant contact of the cam follower, the metal is chrome-cobalt steel because hardness is necessary. The stem and head which have but a slight expansion are made of Invar, a nickel-steel alloy characterized by a low co-efficent of expansion. The rim of the valve which is subjected to the tremendous heat of explosion and the high heat of the exhaust gases is made of another high heat resisting alloy steel. The rim welded to the head insures against warping and thus a good seating valve is obtained under all conditions.

More Space for Water Jacket

In several of the new engines more space has been allotted to the water jacket surrounding the valves. This helps to keep the valve temperature down and prevents distortion of the valves or valve seats. In one or two cases the valve guides, which by the way are removable in most engines, have been made slightly longer to distribute the load and get longer life to the parts. Practically all users of the L-head type of engine fit the tappets in removable guides, so that the guides and tappets can be removed as a unit.

The mushroom type of tappet now is practically universal with engine makers. Usually the tappets are slightly off center with the cams on the camshaft, so that a slight rotation will be set up in the tappets to distribute the wear more evenly. The use of hollow tappets has done much to reduce the



The piston used in the Cole eight cylinder. It also is of the constant clearance type

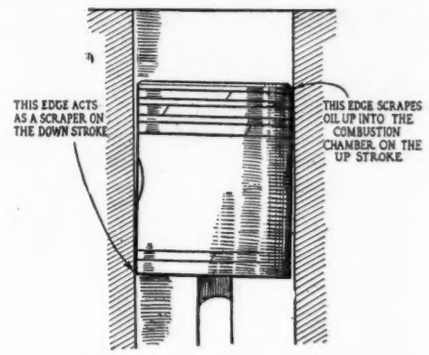
weight of these reciprocating parts and results in a snappier action of the engine, especially if all other reciprocating parts have been reduced in weight proportionately.

It is interesting to note here that the valve cage, formerly quite popular with some makers, has been abandoned and today we find valves seated directly in the head casting. This makes for a simpler construction and there is better cooling of the valves because the water can be led more closely to the valve itself. The removable head, now used by most makers, has also done much towards the elimination of the valve cage.

Balancing of Shafts and Flywheels

Along in line with the general improvement in engine design, much has been done to reduce vibration and insure a smoother running job in general. Naturally the crankshaft, literally the backbone of any engine, has come in for its share of attention. Heavier and stiffer shafts are used in the majority of engines today. Here again we find much has been done in the producing of crankshafts and camshafts, which makes for better manufacture and a better product when installed in engines.

Balancing of shafts and flywheels has done much to get smoother running engines. Makers are working to close limits on this. For instance, one maker is balancing the crankshaft in a machine so that it is not more than .003 in. out when the shaft is rotating at 2000 r.p.m. and supported at the two ends. The measurement is taken on the middle bearing and simply means that such a



If a piston is cocked in the cylinder there is a decided scraping action set up on the walls as shown. Perfect alignment is necessary to overcome it

shaft revolving at that rate will not wobble over .003 in.

There is less tendency for the makers to bolt on counterbalance weights to the crank throws. Many of the shafts used today are of the inherently balanced type and usually have bow shaped throws. The bearings are larger than formerly and much of this has been made possible by the advent of the hollow crankshaft or pressure feed lubrication system. Thus makers can build their crankshafts larger because the linear speed of the shaft can be greater owing to the assurance of oiling at all times. The larger and stiffer shafts cut down vibration, the engine runs smoother and the whole engine becomes longer lived.

Dividend Flywheel on Rickenbacker Interesting

One of the most interesting developments of the year is the divided flywheel used on the Rickenbacker engine. Here the total weight of the flywheel has been distributed to the front and rear of the engine. In other words there are two flywheels of about the same weight at each end of the engine. This engine runs exceptionally smooth and much of this is attributed to the divided flywheel.

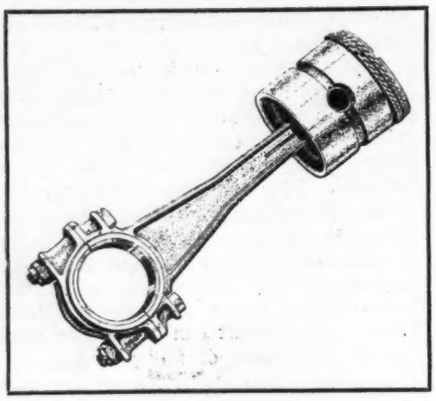
Makers are going to much trouble to balance other rotating parts such as clutches and disks. Where these are put into running balance at the factory the owner who buys a car so equipped has little to worry about vibration.

Another reason why engines are operating better is that in nearly every case makers are fly-cutting and line-reaming the bearings. This is done for both crankshaft and camshaft bearings, and primarily locates both sets. The caps are assembled to the bearing and the cases bored for the crankshaft, camshaft and in case of the National engine, for instance, the water pump driveshaft bearings. The work is done on a remade lathe arranged to bore fly-cut and ream all the bearings and to space the center main bearing.

Flycutting Operation on Single Pointed Tool

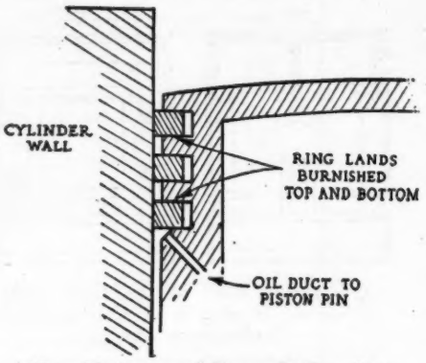
The flycutting operation is done on a single pointed tool which, because of its requiring but a single setting and doing all the work, is more certain to maintain roundness than a multi-pointed tool. This insures alignment of the main and camshaft bearings. After the flycutting operation, the same care is used in finishing the bearing surfaces. The bronze bushings are assembled to the crankcase and it is mounted on a line reaming fixture. The bearings then are line reamed by means of a flycutter and operating at slow speed.

There frequently is a clatter in the camshaft ,especially at slow speed, due to the shaft becoming somewhat unsteady at the time of the opening period of a valve. The valve spring pressure tends to turn the camshaft against the direction of rotation and during the closing period, to turn it in the direction of rotation.



Here is shown the spade type of connecting rod, which has the advantage of distributing the impact from the explosion over a wider area on the crankshaft bearing

As the speed increases these reversals follow each other so rapidly that they become less noticeable. In order to overcome the unsteadiness of camshaft rotation at low speeds the Wills Saint Claire has put a steadying device on its camshafts, incorporating two steel cones against which works a bronze female cone. The friction thus created puts a braking effect on the camshaft.



How Hudson and Essex fit the piston rings to their pistons

For the Maxwell pistons the raw Lynite castings weigh 1.39 lb. and the finished pistons weigh .94 lb., hence a little less than ½ lb. of aluminum is machined off each casting in the manufacture of the finished piston, which is shown in the drawing. As will be noted, it is of a modified slipper type with three rings above the wrist pin. There is a horizontal slot cut around the piston below the lower ring land and a relief formed in the casting adjacent to each of the piston pin bosses. There is also a vertical slot which takes up the expansion of the piston under heat.

Pressure Feed System of Oiling Making Rapid Headway

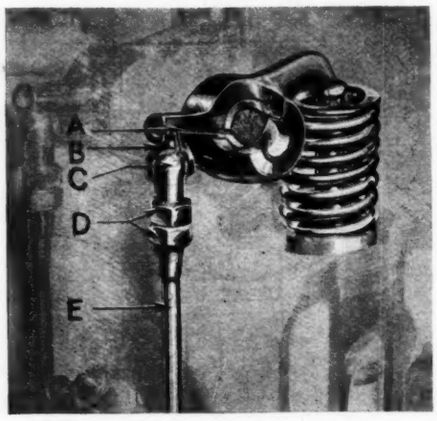
WHERE engines are made by the thousands it is not possible to work the rubbing surfaces to a ished surface. Comparatively speaking the surfaces are rough and must be reduced to a condition similar to that secured when pistons and cylinders are lapped in. This process of getting the surfaces to a highly finished state must, of course, largely be done with the engine in the hands of the average car owner.

Lubrication is the great go-between that spells the success or failure of any engine and in this the car and engine maker has done much during the last year or so to help the car owner get maximum efficiency from his engine.

In the matter of engine lubrication it is not sufficient to consider merely the type of oiling system. It is important that the rotating or rubbing surfaces of the engine be so machined or finished that they will work in harmony with the particular oiling system used. The success or failure of any oiling system is dependent upon other factors. For instance, some engine makers ream, some bore and some grind their cylinders to a finish.

Then there are variations in the material used. Some cylinder blocks are not seasoned as long as others and the rate of wear in these will vary. The carbureting of the fuel is important. There now is generally a better way of introducing the gas into the combustion chambers so that on some engines, like a six-cylinder, there is not a tendency for the heavier particles of fuel to be thrown to the outside cylinders and these as a result becoming worn or scored from the cutting of the oil film by raw fuel, even though the lubricating system may have functioned correctly at all times. Lubrication and carburetion, therefore, must to a certain extent go hand in hand.

As a general thing it might be said that engines used in the cars today are longer lived because of the larger bearing surfaces made possible largely by the pressure feed system of lubrication.



How Buick oils the valve rockers. A is a passage for oil to the ball C

This system has made possible a higher linear velocity of the crankshaft. In other words, it now is possible for engine makers to use larger crankshafts, that is, shafts with a bigger diameter through the bearings. These larger and stiffer crankshafts cut down vibration and with less distortion there naturally is less wear on the bearings, the engine runs smoother and its life is prolonged.

Pressure Feed System Popular

Coming to actual use of the various systems of engine lubrication there is a tendency for the pressure feed system to gain over the others. This system got a good foot-hold some years ago and with the advent of the so-called high speed engine it became popular with makers of these engines because of the importance of getting plenty of lubricant at all times to the bearings and other parts subject to wear. In every case where a high pressure system of oiling is used the crankshaft has been drilled.

Such an oiling system often is called the "hollow crankshaft type," because the shaft is depended upon to carry the oil to the main and connecting rod bearings. With a few exceptions, all the users of the pressure feed system employ a pump of the gear type to feed the oil. The plunger type of pump usua l operated off the camshaft apparently has seen its last days so far as its use is concerned with the high pressure systems.

Some idea as to the growing popularity of the hollow crankshaft type of lubrication system can be gleaned from the figures taken from a count of seventy-five makers. Out of this number forty-one are using the hollow crankshaft or full pressure lubrication, while twenty-six are using the circulating splash system, wherein the connecting rods dip into troughs which are kept supplied by a circulating pump. Eight makers are using an oiling system wherein the pressure is controlled by the vacuum in the intake manifold.

Plunger Pump Still Used

Where a low pressure system is used the plunger type of pump still is fitted by some makers and works out very well in such cases, especially where the engine is not of the high speed type. For example, Mitchell in its new engine is doing this. In connection with oil pumps mention might be made here that more attention has been paid the last year towards getting the pumps better located, particularly as to their accessibility. In nearly every case where the pump, especially the plunger type, is located on the exterior of the crankcase, it is held in place by two or three cap screws and the entire pump mechanism can be removed by taking out these screws.

Where a gear pump is used this often is placed inside the crankcase, so that a removal of a plate on the bottom of the case permits of the removal of the pump. In many cases pumps so located

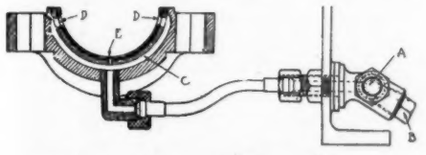
are surrounded by a screen. Thus, on the Wills St. Claire the gear pump is attached directly to a transverse rib in the lower crankcase and is completely inclosed by a screen.

Both screen and pump can be removed through the oil drain hole. In drilling the holes in the crankshaft of the Wills Sainte Claire engine there is a departure from the usual method. The holes are drilled off center and the opening is formed like a scoop to assist in picking up the oil.

There is quite a tendency to incorporate the drive of gear type oil pumps with that of the distributer, a notable example of this being found in the Jordan, Rickenbacker and a few other engines. In the former the pump is driven off the bottom of the distributer shaft, the two units being placed just behind the timing gear case. In the Rickenbacker engine the oil pump and distributer shaft are in the center of the engine. This places the oil pump in a position where it is immersed in the oil at all times and also brings the distributer into an accessible position at the top of the engine.

Durant Four Oiling System

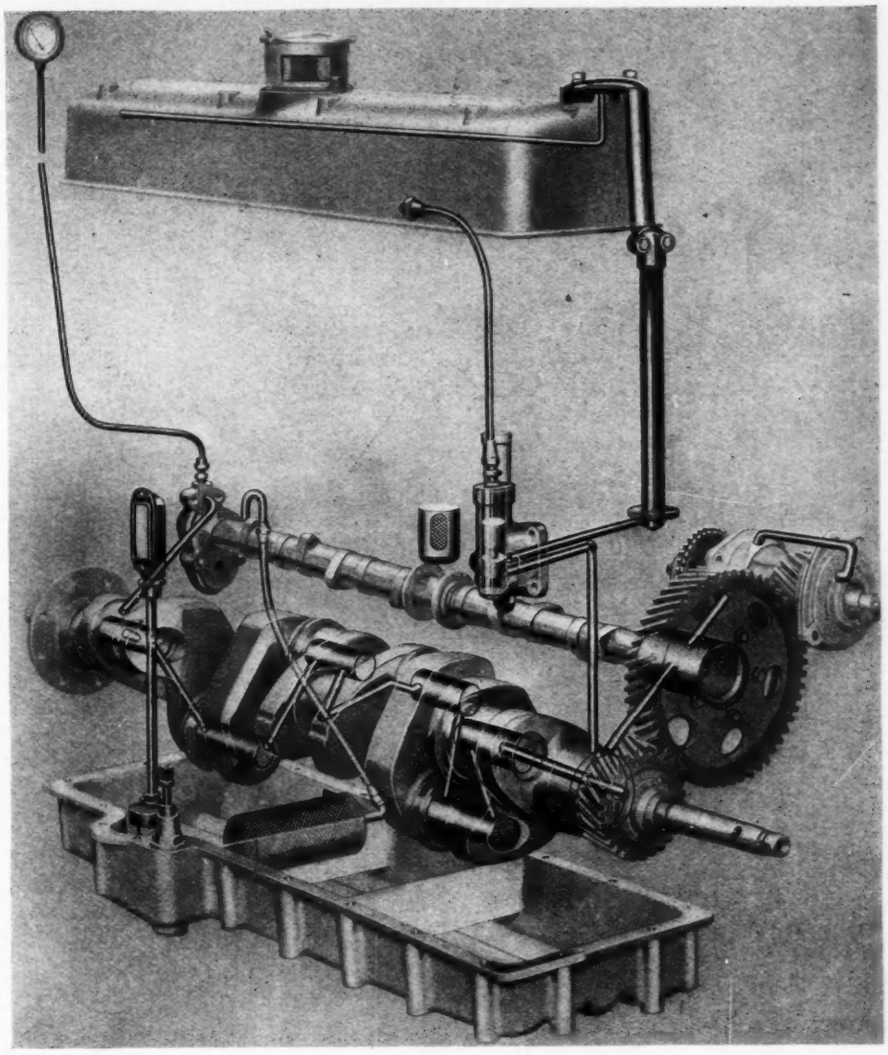
A gear type of pump is used in connection with a circulating splash system of oiling on the Durant Four. The pump is mounted on the outside of the crankcase and is driven from the generator through a flexible coupling. On the Buick Four the gear pump for the circulating splash system is located in the oil pan and is driven directly by the camshaft. This is so built that it can be removed from below for cleaning or inspection, and is entirely exposed when the pan is dropped. From the above paragraphs it will be noted that makers have done much to get a good location for the oil pump, both as regards its operation and accessibility.



Mitchell method of oiling main bearings. The space back of the bearing forms a reservoir, the oil being forced through holes D and E under high pressure

What is true of locating the pumps is also true of other parts of the oiling system such as the leads going to the various bearings. Several engine makers are locating the leads on the exterior of the engine and attaching the tubes with a rise and fall in them to take up any variations. Haynes is a good example of this, as is also the new Mitchell engine. In the latter case the rise and fall serves another purpose. There is a drain at each T where connections are made to the main bearings and a plug can be removed from any drain to affect the oil in that particular lead only.

In oiling systems of the pressure type, that is the high pressure type, it is essential to install some sort of relief valve which can be regulated to suit conditions. It is noteworthy that in about every case these adjustments for the oil pressure have been located so that the operation can be performed with a screwdriver and small wrench to loosen the locknut.



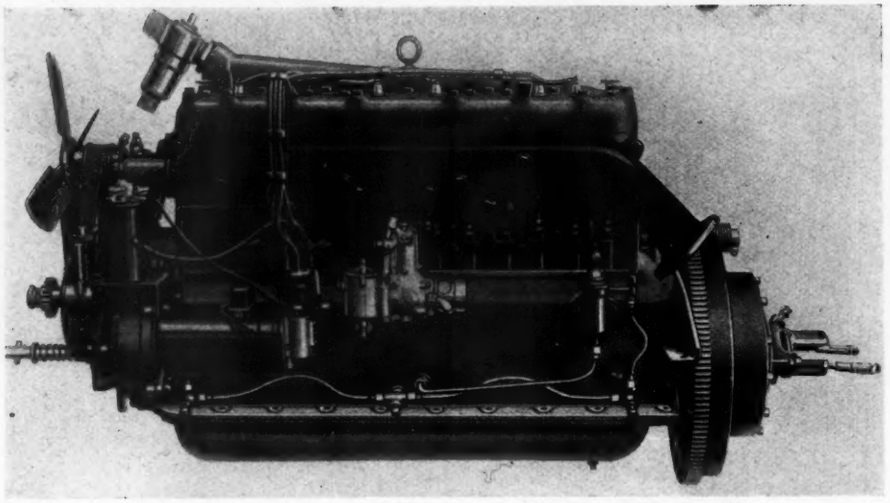
Perspective layout of the Marmon system of oiling. The oil pump is on the back of the camshaft. The flow of oil is indicated by the tubes and passages in the hollow crankshaft. This is a full force feed system

Better Provision for Proper Oiling

Better provision has been made for the proper oiling of timing gears and camshafts. It was quite common a few years ago to provide separate means for oiling the timing gears, but today nearly all front end drives are oiled by a lead working off the same system as that which oils the other parts of the engine. On the pressure systems or circulating splash systems an oil tube usually conveys the oil to the housing for the front end drive and it practically operates in a bath at all times. In some instances the front end drives are oiled from the camshaft, Cadillac being a notable example of this.

This has been made possible by adopting a hollow camshaft, which eliminates several leads formerly used and makes for simplicity. In some cases camshafts are oiled by splash, pockets being cast above the camshaft bearings to catch the oil. In such cases oil is helped into the pockets by casting curved surfaces above the pockets to guide the oil into them. What is true of the front end drive, or timing gear drive oiling is also true largely of the valve operating mechanism. With pressure lubrication it is possible to keep the tappets, tappet guides, followers, cams, etc., in a bath of oil. Where this is true it becomes necessary to use cork gaskets between the valve chamber and covers, otherwise a great deal of oil would be wasted through leakage.

More attention is being given to oiling the valve mechanism of overhead valve engines. With pressure feed it becomes relatively easy to run a lead into the end of the rocker tube, or shaft which supports the rocker arms. These arms in some cases are made with openings in them to carry the oil out to the ball and



Exterior of the Mitchell engine, showing the accessible layout of the oil leads. The pump also is placed on the outside for ready inspection

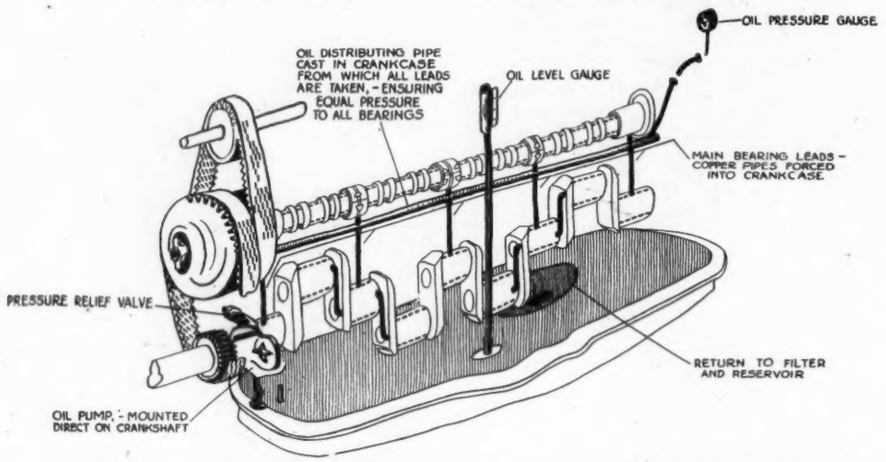

OIL PRESSURE GAUGE
OIL DISTRIBUTING PIPE CAST IN CRANKCASE FROM WHICH ALL LEADS ARE TAKEN, - ENSURING EQUAL PRESSURE TO ALL BEARINGS
OIL LEVEL GAUGE
MAIN BEARING LEADS - COPPER PIPES FORCED INTO CRANKCASE
PRESSURE RELIEF VALVE
RETURN TO FILTER AND RESERVOIR
OIL PUMP, - MOUNTED DIRECT ON CRANKSHAFT

Diagram of the oiling system used on the Lafayette. An oil distributing pipe cast into the crankcase is used as a feeder for all the parts to be oiled. This illustrates the full pressure feed type of oiling

where the latter communicates with the socket in the top of the push rod.

Stephens is a notable example of this. National is an example of where oil is forced into the rocker tube. On some engines the oil mist is depended upon to oil the rockers and ball joints. Nash is an example of this. The rockers and ball joints are provided with holes to catch the condensed oil mist thrown into the chamber by the splash in the crankcase.

Cylinder and Piston Oiling

Cylinder and pistons are oiled usually by the overflow throw off from the connecting rod bearings or in the constant level splash systems by dippers on the ends of the rods which communicate with oil held in troughs under the rods. Many makers are providing sheet steel oil pans, which being quite thin cools the oil. Most of the crankcases now used have settling chambers to catch dirt and metallic particles and these chambers always are so placed that the foreign substances cannot get back into the oil again.

A few makers now are controlling the oil pressure by the vacuum in the intake manifold. Noticeable examples of this are Lexington, Marmon and the new Midwest engine. All told there are eight makers using this type of oiling system.

While much has been done to insure proper lubrication of engines as regards getting plenty of oil to the bearings and rubbing surfaces at all times, much work also has been done along lines that guard against over-lubrication, with its resultant fouling of the plugs, rapid carbonization and other undesirable features.

Along this line also it must be pointed out here that the subject of oil dilution has received probably as much attention by engine makers as any other item. The problem of oil dilution is one which largely resolves itself into methods of handling fuel and intake gases, a subject so involved that it is treated separately in another part of this issue.

As was pointed out in the beginning of this article the item of cylinder and piston material, its finish, etc., has much to do with proper oiling of an engine. Aside from using better methods in the machining of engine blocks and pistons the engine makers have given much thought to the piston rings.

The majority of pistons now have some means for taking care of any access oil which might get onto the cylinder walls. Sometimes this is done by fitting a scraper ring at the bottom of the piston and in other instances the rings have been chamfered on the upper edges, but left sharp on the bottom to scrape the oil down on the walls.

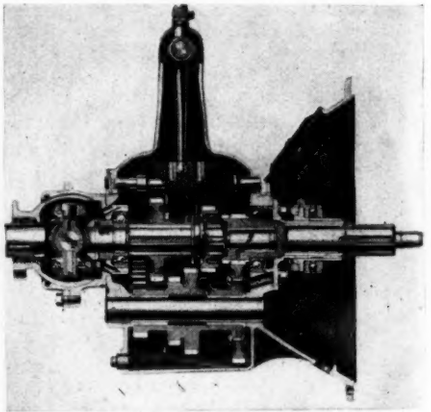
Hudson and Essex Rings

In connection with rings, it might be said here that the manner in which Hudson and Essex make piston rings is intended to prevent oil getting into the combustion chamber. The rings are fitted to within .005 on the top and bottom of the ring lands, which are burnished, but left with plenty of clearance behind the ring. The thought here is that the ring cannot move up or down in the land and consequently no oil can be pumped by the rings in the travel of the piston. Where rings are fitted loosely they are momentarily held stationary against the cylinder wall at the start of the down stroke of the piston and also at the start of the up stroke. Thus, at each stage, oil which gets behind the rings is carried little by little to the top of the cylinder and finally gets into the combustion chamber.

Several engine makers are making pistons so they will slide easier in the bores by drilling holes circumferentially around the piston to relieve the pressure on the intake stroke. This feature is especially desirable in lightweight pistons and in the so-called high speed engines. Much has been done in the past year towards using the superfluous oil on the cylinder walls to lubricate the piston pins.

Very often this is accomplished by machining a flat on the piston just above the ends of the piston pin and drilling holes on a slant through the piston and pin boss from the bottom of the flat. The lower edge of the lower piston ring which acts as a scraper then fills the small chamber formed by the flat and the oil drains to the piston pin bearings.

In other instances holes are drilled around the bottom land of the lower



In the Buick Four the universal joint is oiled from the gearset through passages back of the bearing

piston ring, which ring acts the same as mentioned above, the oil being led through the holes in the piston and allowed to drain back into the sump, some of it finding its way to the piston pin.

More thought is being given to the oiling of main and connecting rod bearings, particularly in the matter of cutting oil grooves in babbitt bearing metal. Instead of crossing the grooves in the halves of the bearings some makers now cut a recess extending almost the entire width of the bearing caps to form reservoirs for oil. This has the advantage that the oil is fed to the bearings along the entire length of the bearing, whereas, in some cases where the cross grooves are used oil travels more or less in a circular path along the grooves and does not furnish as complete lubrication.

More Attention Has Been Given to Mounting Engine Accessories and Front End Drive

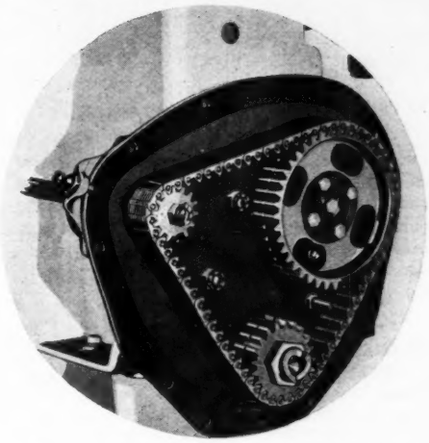
THERE is almost a landslide in the direction of silent chains for driving the camshaft and auxiliary shafts. In the 1921 cars, the percentage of models using the chain type of drive was only 17 whereas the 1922 cars show 38 per cent with a strong probability that several more makers will adopt this style of drive within a short time. A peculiar angle to the front end drive situation is that last year none of the assembled cars used the chain drive because no separate engine manufacturer put out a model with this form of drive.

This year, however, one engine maker already has two models so fitted and others are said to be on the way. Other engine makers may follow suit and this will bring the total of chain drives up to a very high percentage. Cars for 1922 using the chain drive include Ambassador, Ace, Ogren, Revere, Haynes, Jordan, Moon and Saxon. These are firms that have heretofore used some other form of front end drive.

Those which already were included in the list of chain drive adherents are still on the list and these include Brewster, Cadillac, Chalmers, Chandler, Cleveland, Hupmobile, King, LaFayette, Lincoln, Meteor, Mercer, National, Packard, R & V Knight, Stearns-Knight, Studebaker (one model), Templar, Willys-Knight, Winton.

Aside from the chain drive, practically all the rest of the cars use a helical gear.

In many instances, those makers employing the gear type of drive use alternate gears of different metals such as iron and steel and there is a strong tendency toward the use of compressed cotton gears. The great majority of gear drives are steel against cast iron as this has been found to reduce resonance which has been apt to give trouble. Where two gears are of cast iron or steel or two of steel, the gears are apt to sing and the use of these other materials has been largely to reduce this resonance or eliminate it entirely.

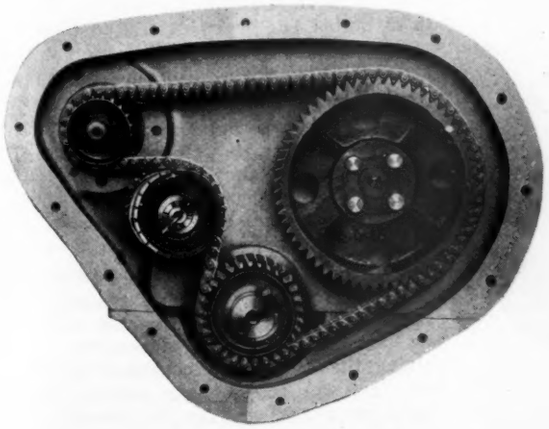


Front end drive of the Studebaker, showing the exterior adjustment which is very handy for service

Some Cars Using Fabroil

Forged Duralmin gears in place of cast iron are being successfully used by Continental and Marmon. It has good bearing qualities, is non-resonant and the expansion of the gear is the same as the crankcase so that the gear center distances will not be subejct to change when the engine heats up. The characteristic property which distinguishes this metal from other aluminum alloys is that it can be forged.

Some of the cars using fabroil gears are the Buick, Paige, Wills Sainte Claire and DuPont. This material is a special compressed, spirally wound cotton type made by the General Electric Co.



Here is shown the link belt drive for camshaft and accessory units on the Haynes. Play is automatically taken up by the idler shown between the crankshaft and other small gear

Other Features of Chain Drive

Aside from the silence feature, the chain drive brings with it the necessity for proper adjustment. To secure the full efficiency of the chain drive and reap the advantages, especially as far as silence is concerned, some means of taking up the stretch must be provided. It must be possible to reduce the length of the chain by degrees one full link, after which a link can be removed from the chain and the adjustment let out again. This gives unlimited adjustment. The adjustment must be accessible so that it can be easily made when required.

There are several types of chains used in the various layouts and also several different methods of securing adjustment. Among the methods of adjustment are:

Movable idler,
Movable sprocket,
Eccentric adjustment,
Double adjustment,
Automatic idlers.

When an idler is used either for purposes of adjustment or to take up chain whip, the idler is designed to consume sufficient power to prevent its playing in the chain, as this play will result in noise.

The movable sprocket as a means of adjustment can be used in designs where one of the shafts can be moved in or out within certain limits without destroying any alignments or adjustments. The King car uses such a means of adjustment, the movable sprocket being the one that drives the generator. The generator is bolted to a flange on the rear of the chain case and by loosening up two bolts, it can be swung in or out within certain limits. In some cases the rear of the generator shaft is connected to the pump, which is located either halfway back on the crankcase, or at the rear of the crankcase. In this case it will be necessary to use two universal joits to secure alignment with the water pump.

Morse Adjustable Sprocket

In many layouts it is not possible to swing any of the shaft in or out without destroying some alignment and these designs require an eccentric adjustment or an automatic idler. The eccentric adjustment is used on the Lafayette car. The Morse adjustable sprocket is designed to facilitate adjustment of the chain on engines where it is not possible to move one of the shafts.

The sprocket, instead of being mounted on a shaft, is mounted on a bearing

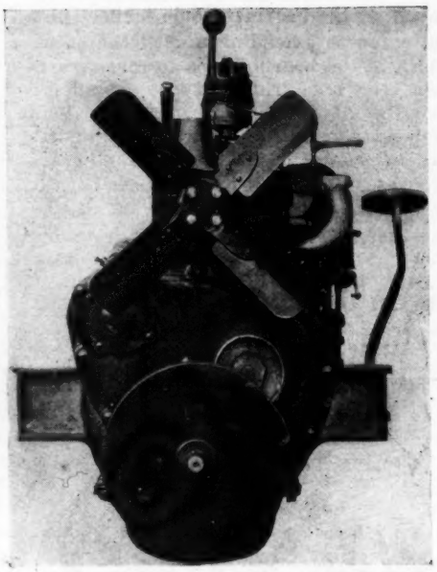
which is eccentric to the shaft. The chain, rotating the sprocket, rotates the shaft by means of a connecting universal coupling of the Oldham type. The bearing on which the sprocket is carried is mounted to the case, concentric with the shaft and by rotating the bearing the sprocket is moved, thus adjusting the chain. This type of adjustment is applicable to any type of drive .

Link-Belt has a liner type of silent chain in which some of the links are reversed in order to provide a bearing surface on both sides of the chain. One of the cars using this type is the new Haynes. This design permits a greater flexibility in design layout, particularly in the drive of auxiliaries. It is possible to obtain sufficient wheel contact with the double sided chain with the shaft in a position where it would be practically impossible to secure the desired amount of contact in any other way. The double sided chain permits of a reverse bend in the chain, which allows it to wrap itself around the wheel with a far greater area of contact than would be possible in any other way.

The Link-Belt automatic adjustment device includes a tension governor which compensates for wear. This is an eccentric device with a spring mounting to maintain constant tension in the chain. The stud is mounted rigidly in the timing gear case and the eccentric on the stud carries the wheel. When the eccentric locates, the wheel moves, regulating the tension in the chain. The amount of tension is controlled by the flat, clock spring which is anchored by means of a collar and adjusted by the exterior adjustment nut.

Side and Center Alignment Defined

There are two general methods of retaining the chains in alignment on the sprocket and these are the side alignments and the center alignment. In the side alignment, the side links of the chain extend across two teeth so that the alternate teeth of the sprocket are covered on both sides of the sprocket. In the center alignment, a fillet is cut clear around the sprocket in the center and in the center of the sprocket ride in this fillet.



The flywheel fitted to the front end of the Rickenbacker. It also shows the accessible mounting of the distributer

In the gear type drive, some makers are using gears of cotton or fabric. The working portion of the Fabroil gear made by the General Electric Co. is cotton, which is held tightly compressed between steel end plates. The Fabroil gear is generally used as a camshaft or as an idler gear.

The layouts of starting motors and generators covers a wide variety in the different cars, but starting are going almost universally to the S. A. E. standard. It is quite general to have the pump and generator on the same driveshaft either mounted close together or one at each end of the crankcase. Where they are mounted close together, there is no universal joint between, but where they are mounted on opposite ends of the crankcase it is usual to provide two universal joints, usually of the fabric type on the shaft that connects them.

Distributer drives for 1922 have undergone no great change with the exception that the new Rickenbacker and Wills Sainte Claire have a distributer drive somewhat different.

Auxiliary Mountings

The Wills Sainte Claire has an unusual drive to the overhead camshaft. From the crankshaft there is a drive by spiral head gear and pinion to an intermediate shaft by spiral bevel gears and an enclosed shaft takes the drive from this shaft to the two overhead camshafts. Inserted in the drive is an Oldham coupling with offset driving lugs mentioned previously in this article. Each camshaft is carried on three bearings, the rear bearing being of special design to eliminate noise due to unsteady rattling of the camshaft.

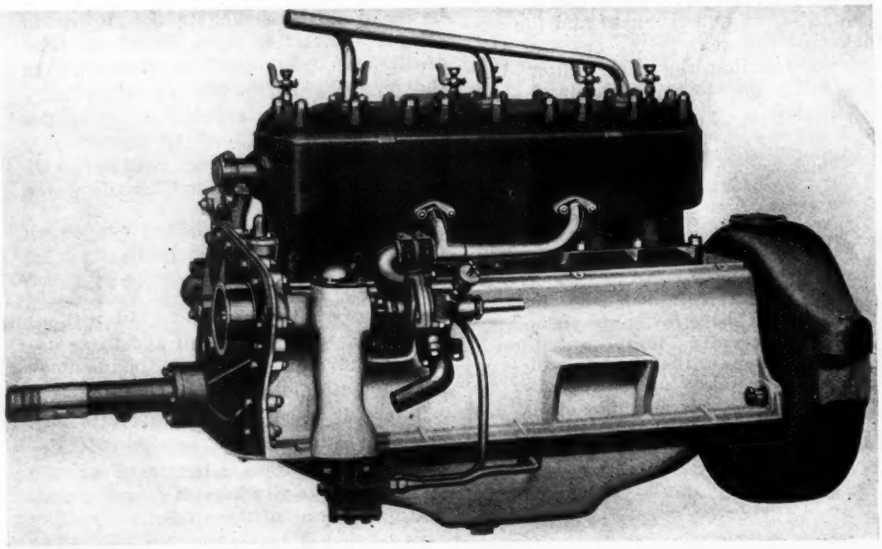
This variation in rotative speed of the camshaft is due to the fact that at the opening period of the valves, the valve spring pressure tends to retard the motion of the camshaft, while during the closing period it tends to accelerate it. This reversal of pressure produces an unsteady rotation and is often responsible for the clatter in the camshaft drive, particularly noticeable at low speeds.

To eliminate this unsteadiness of the rotation of the camshaft at low speeds, the Wills Sainte Claire employs a camshaft steadying device which is shown here in section. The end of the camshaft has a male steel cone forged integral with it and another male steel cone is keyed to it. This latter cone rotates with the camshaft, but may slide axially on the shaft.

A bronze double female cone is keyed to the camshaft housing, but may slide axially within it. A coil spring pushes the keyed steel cone toward the other steel cone, thus compressing the female front cone between the rotating steel cone. The friction thus set up is enough to give the desired braking effect and so steadies the rotation of the camshaft.

Automatic Fan Release

Another feature of the Wills Sainte Claire is the automatic fan release. The fan is pulled backward against the fanshaft by a spring. When in action, the fan tends to move ahead on its shaft and when its speed reaches a certain volume, the forward pull, due to the reaction of the air, is stronger than the backward pull of the fanshaft. The fan is then pulled over the steel cone and slips on it like a disengaged cone clutch. When the fan speed drops, the backward pull of the spring overcomes the forward pull of the fan and the fan reseats itself. As the fan cannot exceed a certain speed, the power accessible for driving the fan is limited regardless of how fast the engine may rotate. The speed at which the fan is released is regulated by spring tension and is gen-



The Paige engine, showing the accessible location of the oil pump, filler and water pump

erally about 2,000 engine r.p.m., which corresponds with 3,000 r.p.m. of the fan. The fan is of the three-bladed type and is driven off the timing gearset. The fan generator drive gear is of Fabroil and is located at the front of the engine and enclosed within the aluminum crankcase timing gear cover.

The new Jordan uses an engine largely designed by the Jordan engineering staff, but manufactured in the Continental plant. It is one of the two models of Continental engines using the front end chain drive. This is a new departure for Jordan and for Continental. The drive is of triangular layout, the chain passing over the crankshaft, camshaft and auxiliary shaft sprocket. Chain adjustment is made by worming the auxiliary shaft outward until the proper tension is applied in the chain. This adjustment is available and the units driven by the shaft are so arranged that they are not affected by the adjustment. The auxiliary shaft carries the fan pulley, which is in front of the chain case. Immediately behind the case are the vertical distributer shaft (driven by helical gears), the oil pump, water pump and the generator, the latter being driven through two couplings.

New Cadillac Adjustment

A new chain drive adjustment is used on the Cadillac, model 61. The chain is so designed that when properly adjusted enough play is left for the chain to permit an oscillation of 1 in. at the periphery of the fan. The adjustment is by means of an eccentric sprocket shaft. In the earlier models, the camshaft sprockets were integral and had their bearings directly on the camshaft. The camshaft sprockets now rotate upon eccentric surfaces located on a supporting member, which is clamped on the crankshaft by a locking device. The camshaft also rotates on a bearing carried on this support. By turning the eccentric surface by means of an adjusting worm, the distance between the crankshaft sprocket and camshaft sprocket or between the camshaft sprocket and fan sprocket is increased, thus driving the chain off.

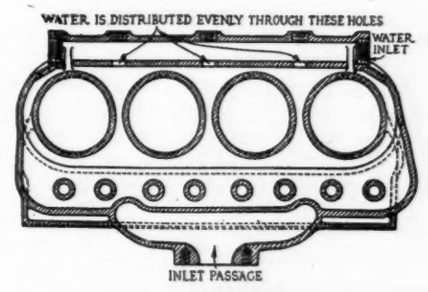
Larger Water Passages Feature Engines This Year.
Less Chance for Block Warpage

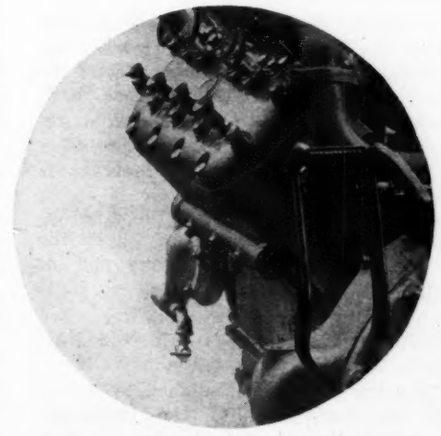
WHILE on the surface it would appear that there had not been much change in cooling and the temperature control of automobile engines, still a close examination shows that there have been a number of detail refinements which are quite important. As far as the fundamental cooling systems are concerned, we still have the three basic systems which are employed in automobile practice. These are the pump and thermo-syphon water cooling and air cooling.

The percentage of cars using each of these types of cooling remains about the same, but according to a great many indications there are going to be some radical developments in at least the air-cooling field, and very possibly some marked changes in percentage as between thermo-syphon and pump cooling.

The way matters stand now in the percentage table, thermo-syphon is used on about one-third of the makes, and pump cooling on two-thirds. As there are only two or three air-cooled cars on the market at the present time, these do not cut any figure in the percentage table. With the announcement of the General Motors Co., however, that it is about to bring out an air-cooled car, it is quite possible that we are going to have some changes as far as air-cooling is concerned. The addition of the Wills Sainte Claire car to the thermo-syphon column helps a little in boosting the percentage of thermo-syphon cooled cars. However, during the past 3 or 4 years the percentage as between thermo-syphon asd pump cooling remains about stationary.

An examination of the makes of cars using thermo-syphon cooling shows that in the main the lower priced cars employ this system, while the higher priced cars use the pump. The Wills Sainte Claire, however, is a notable exception to this as it is in the $3,000 class and still employs the thermo-syphon.





Above, sectional view of the water passages on the Oldsmobile Eight. Below, a perspective view of the same layout. Note that the water completely surrounds each cylinder

As far as engineering advantages and disadvantages are concerned they cannot be said to weigh heavily on either side. The pump cooling system has in its favor the fact that less water is used in the system, the radiator can consequently be relatively smaller and, in spite of the added pump and pump drive parts, the final result is probably a a lighter system. On the other hand, thermo-syphon has the advantage of simplicity and furthermore, automatically attains practically the same result as is secured with thermostatic control on a pump system.

Marked Difference in Warming Period

In other words, the water does not begin to circulate until it is warm and, consequently, there is a marked difference in warming up period as compared between the thermo-syphon system and a pump system, unless some form of thermostat is used on the pump system. This has been realized very fully by car manufacturers and there has consequently been a very marked increase in thermostatic control of the water temperature, now that it has been realized that this practice is practical and gives little or no trouble.

One of the troubles which was experienced in the first thermostatic control systems was the tendency of the water to freeze in the radiator, while it was held stationary during the time the water was only permitted to circulate around the jacket. By arrangement of the pump and position of the thermostat, an endeavor is being made to keep the water in the radiator during the time the engine is warming up.

On most of the engines, the thermostat is set to start to open at about 130 deg. Fahr. On some, this is increased to 150 deg., but on the majority, the thermostat starts to open the by-pass valve at 130 and is completely open by the time the water temperature around the cylinder block reaches 150 deg.

Probably one of the most ingenious water systems developed during the past year is that incorporated in the new General Motors truck. This is virtually a combined thermo-syphon and pump system. The water passages are so arranged that the water adjacent to the cylinders is circulated by the thermo-syphon system and the remainder of the water above the combustion chamber and around the valves is circulated by the pump.

G. M. C. Cooling System

An unusual feature in the G. M. C. truck cooling system is the fact that the water pump is mounted on the end of the fan spindle. This position for the pump, of course, would only be possible in a system which uses a large volume of water, so that there is no danger of the water level ever going below the water pump, thus starving the system. In this engine the volume of

water above the pump level is very considerable.

High Position Water Pump.

The Packard single-six was the first to use the high position of the water pump. On this car, a centrifugal water pump is mounted at the forward end of the cylinder head. The water pump housing is cast integrally with the cylinder head. The thermostat is located above the pump and by-passes the water around the radiator until it has reached the proper temperature to permit efficient running of the engine.

A by-pass tube connects the thermostat housing with the water inlet manifold at the bottom of the cylinder block. Valves controlling the entrance to the radiator and the by-pass tube are carried on a shaft actuated by the action of the thermostat syphon. Normally, when the water is cold, the radiator valve is closed and the by-pass inlet valve is opened, allowing the water to circulate through the pump and back to the cylinder jacket without entering the radiator.

Radiator Shutters

As the water becomes heated, the expansion of the syphon causes the radiator inlet valve to open, and at the same time, closes the by-pass valve, making it necessary for all of the water to circulate through the radiator. Outside of the position of the sylphon thermostat, this arrangement is of the pump system using thermostatic control. It will be noticed, however, in this system that the water in the radiator remains stationary until the engine is warmed up. It is this condition which engineers are trying to improve.

One of the methods of improving the situation as regards the freezing of water in the radiator is the use of shutters. We have had the shutters on the Hudson and Columbia cars for a considerable length of time. The Lincoln and Lafayette were next in line and since that time no one has adopted them as standard equipment.

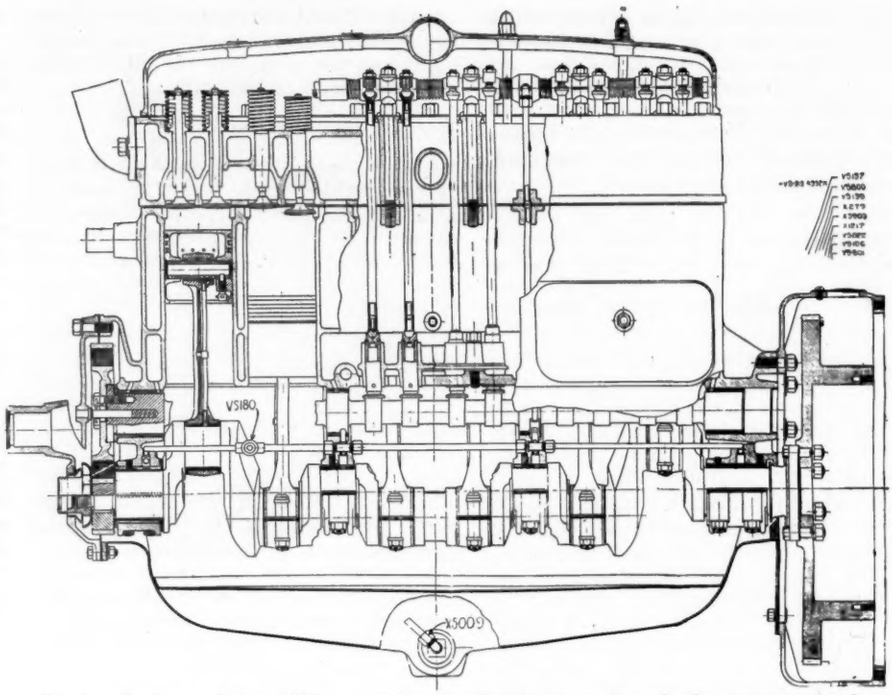
Thermostatic Control

However, shutters which can be attached to the front by the owner are becoming quite frequent. One make, the winter-front, which incorporates the thermostatic control, has had a good sale. On the Essex car, the hand control shutter is employed with success. This, of course, is standard equipment, but is a manually operated control and not by thermostat. On cars equipped with thermostats, it is quite essential that a motor meter be employed in order that a check on the water temperature and on the action of the shutter is provided.

This is invariably the case. The adoption of motometers as standard equipment has increased during the year, so that it is now quite common on many medium and most high priced cars.

Two Pumps on Oldsmobile.

On the new Oldsmobile eight there are two water pumps which are carried on the front gear cover and are so located as to line up with the particular blocks which they supply. They are driven at crankshaft speed and their impellers are of the enclosed vein type, to eliminate wall friction in the pump. The practice of using two independent water pumps for eight-cylinder engines is universal, and this would be expected on account of the necessity for having a positive flow to each block with the water temperature in each about the same.



Sectional view of the Velie engine, showing how each cylinder is completely surrounded with water. This is a very important item from a service standpoint, as it insures a block against warping and sticking pistons

Duesenberg Circulation

On detachable cylinder head engines, there has been a tendency toward increasing the water passages from the block to the head where these have shown themselves to be somewhat restricted. On the new Mitchell engine, a very good example of this increase is found.

An interesting feature of the development of the cooling system of this engine is the covering of the front end of cylinder No. 1, so that the wall temperature of this cylinder is not lower when running at high speeds into a cold draft of air, than the other cylinder walls.

This has been accomplished by bringing the front end of the crankcase around the barrel, and also by the position of the water pump directly behind the fan, which further acts as a cover over the block. The thermostat is connected directly to the end of the water header above the cylinder head.

An interesting feature in connection with the new Duesenberg car is the way in which the water is circulated through the cylinder block. This is a pump system, the pump being driven by a cross-shaft which receives its drive from the vertical camshaft. The cross-shaft terminates at the water pump on the right. The water enters the block at the lower right in front and leaves it at a point just above the point of entry.

Circulation Control.

The circulation is controlled by internal baffles. The water system employed on the Cadillac has always been interested. For one reason, the Cadillac was about the first company of large size to adopt the thermostatic control of the cooling water. Another improvement on the Cadillac, which is a very interesting and valuable feature, is the condenser employed for anti-freeze. By making the water system air tight and connecting a small condenser tank to the overflow from the radiator, the anti-freeze which evaporates, passes into this condenser where it is recondensed to a liquid.

As the cooling fluid cools it contracts, tending to create a vacuum which exerts sufficient suction to pull the liquid which has accumulated in the condenser back into the water system. In this way the anti-freeze is conserved.

Accessible Cadillac Drain

This year, a further improvement has been made on the Cadillac system in the way of incorporating a more accessible drain. It is now possible to open and close the valve at the bottom of the pump by means of an ordinary screw driver from a position above the frame, or, in other words, this is accessible by lifting the hood.

An indicator dial showing the position of the valve is now in plain sight. It bears three inscriptions, filled, closed and drained. In filling the system, the valve is turned to permit of easy flow of the water into the system by breaking the air lock.

In normal operation the valve is turned to the closed position, which renders the system air tight and puts the condenser into operation. In the drained position, the valve opens the drain at the bottom and permits the cooling fluid to be removed.

There have been some detailed improvements on the thermostatic control of the cooling liquid in the Cadillac. Instead of the valves being directly mounted on the sylphon thermostat, as formerly, there is now a connection with a sort of universal action so that any warping of the sylphon cannot cock the valve on its seat. The housing containing the sylphon thermostat and the valve is located on the cover of the water pump.

Developments in Air-Cooling.

In draining the system, it is necessary to force the thermostat valves from their seats. This is taken care of by the shaft operated by the screw driver in draining the system, and when the dial is in the drained position, the drain port is not only open at the bottom for the water to flow out, but the thermostat valve is also lifted from its seat.

A discussion of cooling systems would be incomplete without some mention of the developments which seem to be pending on air-cooling. The announcement of the General Motors Corp. that they were working on an air-cooled car, and as soon as experimentation was complete, would announce this car, has excited a great amount of interest throughout the trade. It is well known that experiments on this car are about complete and it is very possible that one or more of the cars will be shown at the New York show.

The endorsement by the General Motors Co., of air-cooling would probably reawaken an interest in this type of vehicle, and very possibly cause the introduction of several other makes, which would make it appear that the percentage table would be materially effected by air-cooling within 3 or 4 years. It is something which dealers as well as engineers are studying with a great amount of interest.

Less Chance for Engine Crankcase Arm Breakage by Virtue of Better Mounting Methods

WHILE no radical change in engine mountings for 1922 cars can be said to have been made during the past year, yet there is a slowly moving change in design which covers several years. With the general introduction of unit power plants some years ago and the greater use of flexible frames which would weave over uneven road surfaces, came the necessity for mounting the engine in such a way that the strains of the twisting frame would not be communicated to the engine and crankcase.

This was very satisfactorily settled by the use of the three-point suspension. While this type still is used by 75 per cent of the makers, there is a slight increase in the number of four-point suspensions and several of these are attributable to the separating of the clutch and gearset from the engine and to the use of a stiffer frame which will not weave to such an extent.

No matter how stiff the frame, there will still be some motion to it, and therefore those makers which have adopted the four-point type of engine mountings have developed some interesting forms of engine foot fastening which will allow for this.

It can be readily seen that were the four corners of the engine rigidly fixed to the four points of the frame, then any twisting of the frame would either twist the feet off the engine or at least twist the crankcase and throw all bearings and other parts out of alignment.

Therefore, in designing a four-point mounting, this fact has received consideration and provision is made for this movement. In the Wills Sainte Clair, the four-point support is worked out by using a combined leaf and coil spring under each of the front feet of the engine. The leaf spring is placed between the engine foot and the frame and the coil spring is used underneath the frame. This particular power plant is of the unit type and has four arms which are integral with the upper half of the crankcase. The rear engine feet are bolted down direct to the frame without the intervention of springs.

The three-point support, which is still numerically the most popular form of mounting, is seen in several varieties. In all cases, the rear feet of the engine are mounted on the frame itself. The front end mounting is sometimes made on a cross frame member and sometimes by an arched member resting on the frame and attached at one point in the center to the front of the engine crankcase.

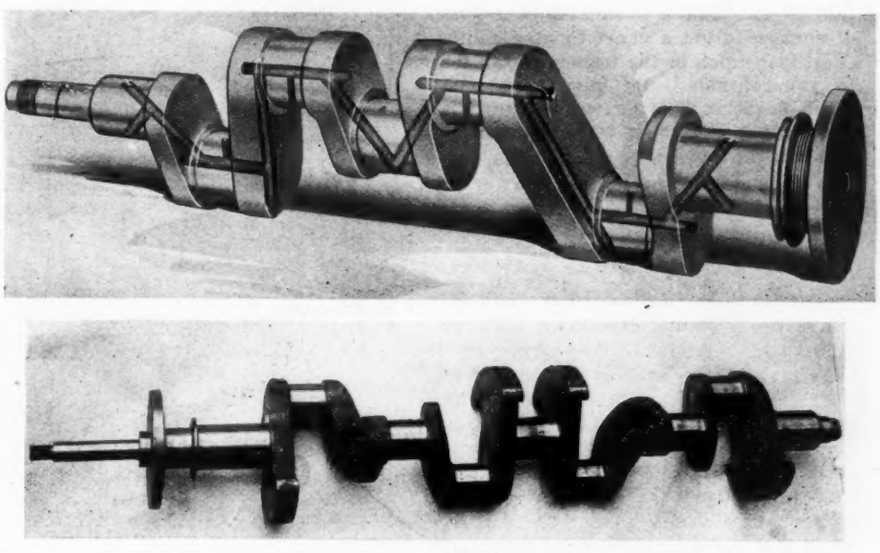
On the new Rickenbacker car the cross front support has been made fairly large and looks somewhat like an eccentric strap on a marine engine. The engine has a circular shoulder that fits into this support and the engine can therefore oscillate in the support. No means of direct lubrication is provided in this case, as the motion is quite minute and there will be sufficient oil to lubricate it for some time.

Change in Design

Other types of front end bearings are provided with Alemite or other patent lubrication means and some of these that are under the engine maintain lubrication from leakage of oil from the crankcase. In one make at least there is a felt wick which extends down from the crankcase through a hole and this maintains lubrication at all times.

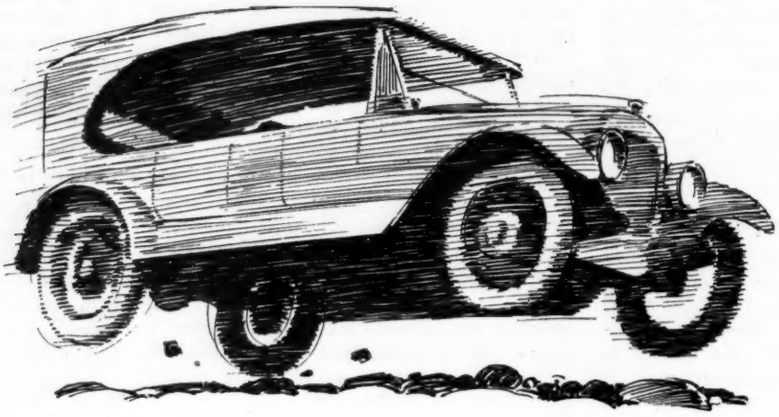
One feature of design that has undergone considerable change in the past few years is that of mounting the engine feet directly on the car frame instead of on a sub frame, which was a pretty much accepted practice several years ago. This change has been brought about largely on account of the modern practice of narrowing the frame up at the front, which is primarily to provide clearance for the wheels in securing a narrow turning radius. The bringing of the side rails closer together at this point has made the use of a sub frame unnecessary.

Some engines, instead of having the rear feet of the engine cast directly on the crankshaft, have a banjo type arm extending across and fastened to the frame side rails. The engine is then fastened to this cross-member.



Above, the crankshaft used in the Midwest engine, showing how it is drilled for full pressure feed oiling. Below, a crankshaft of the curved throw type, with counterbalanced throws

THINGS THAT MAKE *the* CAR STAND UP



FRAMES in This Year's Cars Much More Rigid Than Formerly. Tendency to Fit More Cross Members and Deeper Section Channels. Better Brake Designs. Sturdier Steering Gears. Smaller Wheels

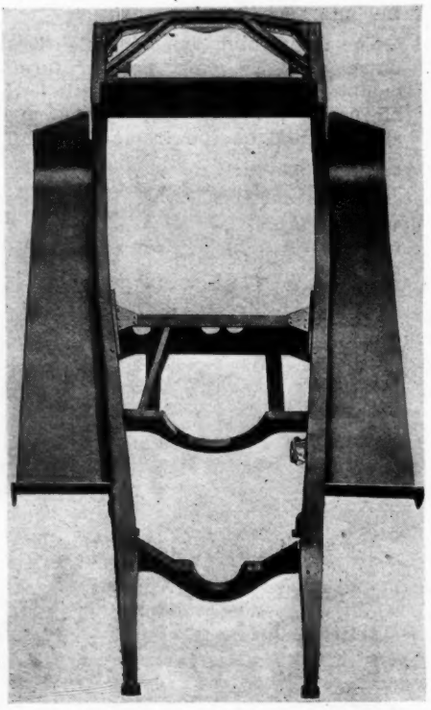
WHILE there has been nothing radically new brought out in motor car frames on the new cars, there are certain things which stand out prominently as having received much attention on the part of car manufacturers. The general shape of frames remains much the same, but if anything there is a tendency to eliminate the bottle neck type of frame and in its place use a frame with straight side rails, although the frame itself may taper from back to front. This is done, of course, to get a short turning radius.

An inspection of the frames shows that in general side rails have been made much deeper. This is true of cars with a comparatively short wheelbase, just as it is true of those with a long wheelbase. For instance, the new Rickenbacker car which has a wheelbase of 117 in. has a frame with a depth of 8 in.

Frame Weaving Minimized

This frame, by the way, is so rigid that when it is rested upon two supports, front and rear, and one corner of it raised, the latter can be raised but 2½ in., whereupon the other end of the frame starts to lift. Heretofore on frames it was common to be able to raise them many more inches, with the result that such frames were not as stiff and consequently would weave considerable when the car was in motion, especially over rough roads.

Frame weaving is a thing which most makers have given a great deal of thought during the past year. One of the causes for bodies becoming loose in the joints and setting up squeaks is that the frame on which they are mounted weaves too much and consequently tends to distort the body structure. Depth of the main frame rails is not the only thing which must be considered in the stiffening of the frame. Cross members play a very important part.



The Brush type of frame construction, in this case that of the Marmon 34. Running boards are integral with side rails

In this respect makers are showing a tendency to put more cross members into the frame structure. In many cases the other parts of the car are used as cross members, particularly the rear supports of the engine. Some cars have as many as seven cross members, including the engine supports.

Marmon, Lexington and the new Elgin use the Brush type of frame construction. The side rails, in the case of the Marmon, are Z-shape, each rail being 4 in. wide on top and bottom and 10 in. deep. The steel running boards are combined as a unit with the side rails. They are hot-riveted to the lower flange of the frame and across it at each end where they curve up to meet the fenders. The frame is so formed that its vertical web is directly under the outer edge of the body and because of the rigidity obtained in this construction there is no need for heavy wood sills as in the conventional body.

Front End of Frames

The front end of frames also comes in for its share of attention. Inspection of the new cars shows that more and more use is being made of tubular cross bars at the extreme front end of the frame, thus binding the two frame horns se-

curely together. Usually the cross bars are made with splines at the ends which fit into recesses cut into the frame horns. The cross bars usually are a driving fit into the frame horns.

The matter of putting these cross bars on the front end of frames is particularly valuable where the front cross member is located quite a distance from the frame horns. Frame makers state that where the front cross member is placed pretty far back on the side rails and no cross bar is used at the horns, such a frame is likely to set up undesirable features in connection with the steering of the car, especially if the frame becomes slightly bent at the front end.

Another tendency in frames is to make the section of the side rail deeper in front of the first cross member, particularly if not tubular cross bar is used at the horns. Cars subjected to very severe use have been known to break frames at this point.

The frame of the new Jordan has been considerably stiffened. This has been done by extending the maximum depth of the side rails over a much greater portion of the length and by the use of tubular cross members at the ends. These cross members are secured to the frame by riveting through steel castings which project into the tube and are keyed to it. Improved riveting and gusseting of the cross members also has added to the rigidity of the frame.

Mention might be made of the unique method in which the frame of the Durant Four has been stiffened by the muffler shell. The muffler is located just inside the right hand frame member, between a cross member directly in front of the gearset and another substantially over the rear axle. The frame is made up of 4½ in. channels with few cross members, of which two are quite flat, so that as a whole the frame is quite flexible.

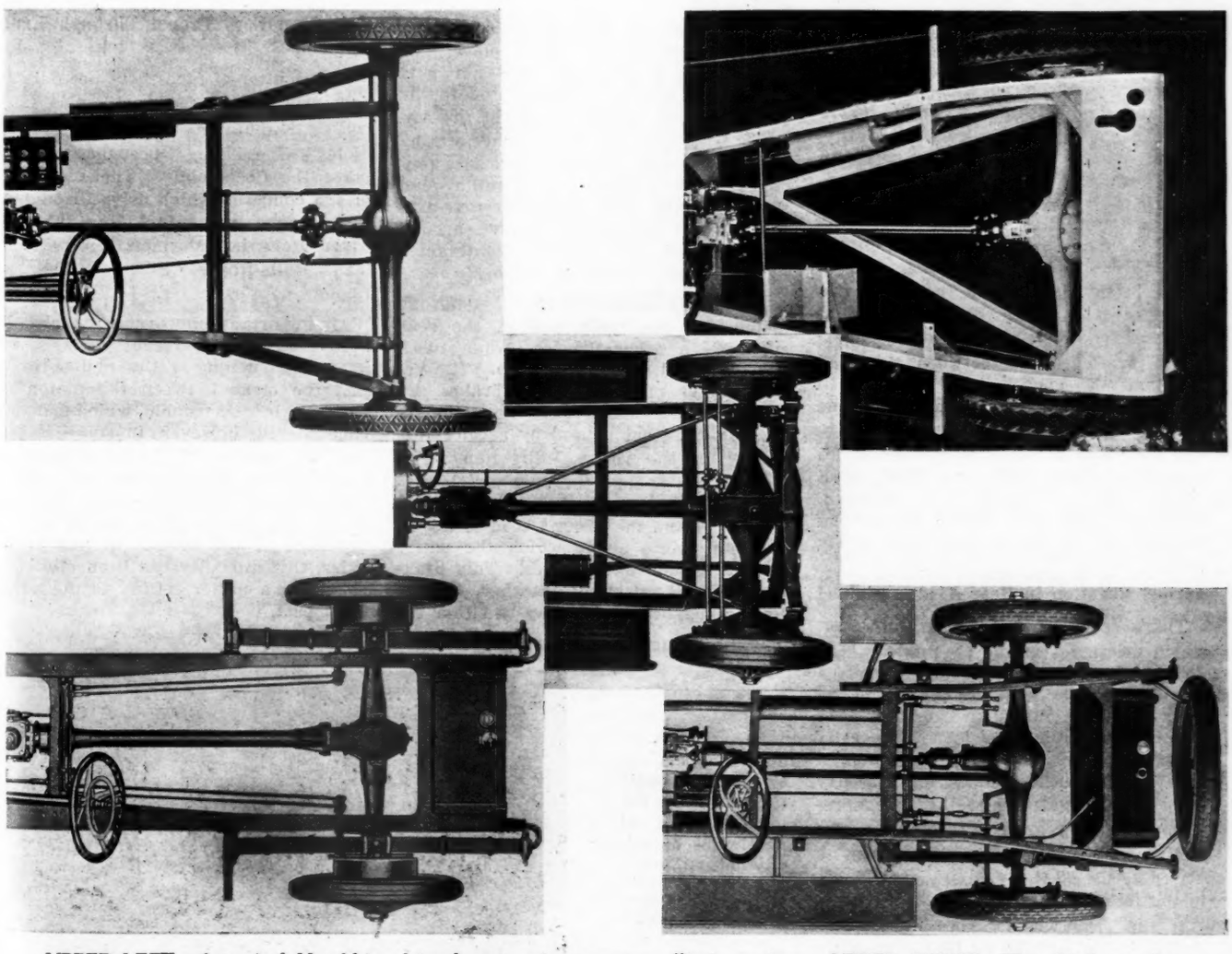
Rapid Gain in the Use of Hotchkiss Drive. Better Axle Gear Adjustment Provided

FINAL drive and the units which compose it have come in for a number of detail changes during the year, but nothing of a marked or radical nature will be noticed. Hotchkiss drive, which has come to be recognized as typical American practice, continues to hold its own.

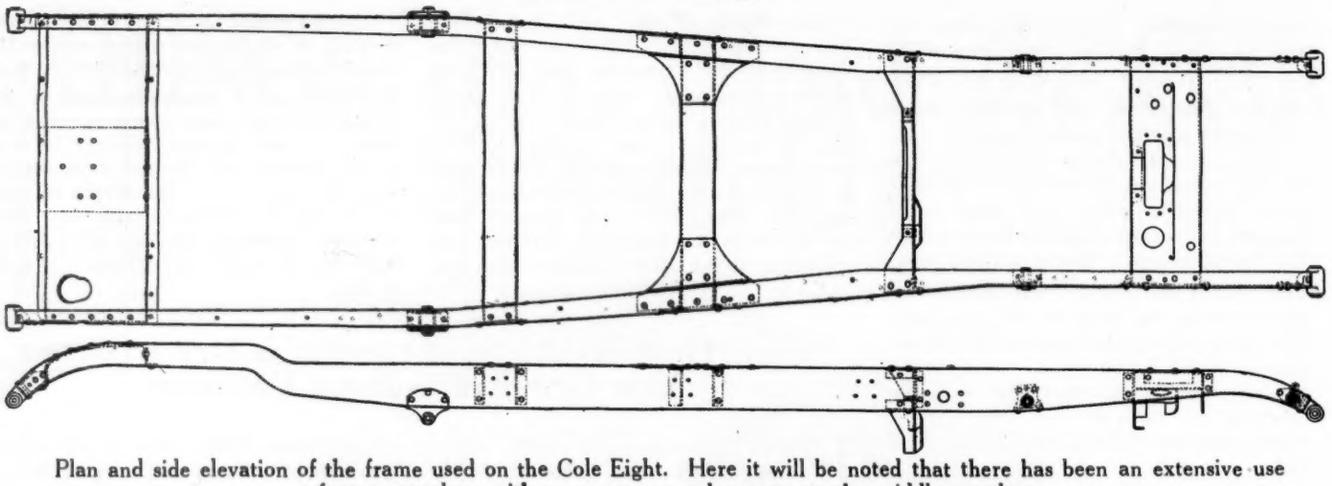
When it is considered that by the use of Hotchkiss drive; that is, by taking both the propulsion and torque through the main leaves of the rear spring, radius rods, torque tubes and other parts are eliminated, it is not surprising that in view of the satisfactory operation that this drive has been widely adopted.

In order to fully grasp what the functions of the final drive are, a short ex-

Five Examples of How the Driving Strains and Torque Reaction Are Taken



UPPER LEFT—A typical Hotchkiss drive layout using quarter elliptic springs. UPPER RIGHT—The third member used on the new Elgin for taking drive and torque. CENTER—Combination torque tube and radius rods on Marmon. LOWER LEFT—H. C. S. rear end member where drive and torque are taken by a tube. LOWER RIGHT—An instance where the drive is through the springs and the torque taken by an arm



Plan and side elevation of the frame used on the Cole Eight. Here it will be noted that there has been an extensive use of cross members with very pronounced gussets on the middle member

planation of the various methods employed to propel the car and to absorb the torque caused by acceleration and braking may not be amiss. The car is propelled by the contact of the rotating rear wheels with the ground. The thrust for driving the car originates, therefore, at the point of contact of the rear tires and the road.

It is necessary that this thrust be transferred from this point to the vehicle through a substantial part in order that there will be no lost motion and consequently rattles and irregular action in the propulsion of the car. Naturally, the thrust from the point of contact with the tire on the ground is transferred to the wheels and thence to the rear axle shaft without any difficulty. From the shaft through the axle bearing it is transmitted to the axle housing. From the axle housing to the main chassis there are several ways of transferring it.

In the Hotchkiss drive, the springs, which are naturally between the rear axle and the chassis, are utilized. In other drives, a tube which surrounds the propeller shaft and is firmly bolted to the rear axle housing is employed, or, sometimes radius rods are fitted, or a torgue rod or structure is employed. These are the units which propel the car, or, in other words, push it along the road.

Torque Reaction in Rear Axle Explained

There is another function, however, which originates at the rear axle, which must be taken care of, and this is the torque caused by applying the brakes, or by accelerating the car. The torque reaction in the rear axle is not generally understood, and, as a mattter of fact, if nine people out of ten in the industry were asked what causes the torque reaction in the rear axle, they would be unable to give a proper explanation.

It may be readily visualized, however, in the following way:

If the rear wheels were firmly connected to the ground so that they could not rotate and the engine were started and the car put in gear, the entire car would tend to rotate around the rear axle, because the drive pinion would try to roll around the bevel ring gear. In other words, since the bevel ring gear would be held stationary and the pinion attempted to revolve, it would naturally have to work its way around the bevel gear in the same sort of a manner as a planetary gear works around the fixed gear.

When a car is accelerated, something of this same action takes place. Of course, the rear wheels are not held stationary, but nevertheless, due to the inertia caused by the weight of the car, there is a reaction to the accelerating thrust and, consequently, there is a tendency for the pinion to try to roll around the ring gears. This causes the rear axle housing to attempt to revolve around the rear axle and must be counteracted by some sort of torque member.

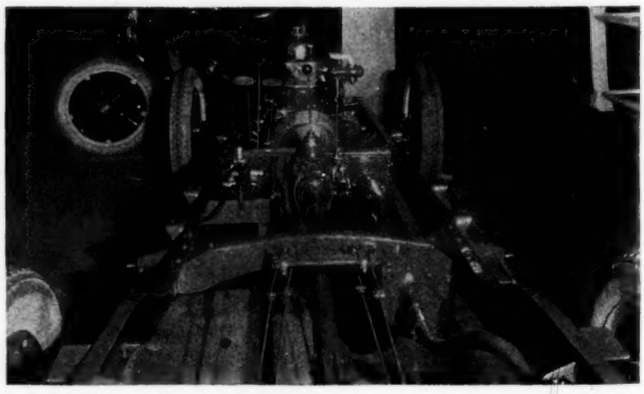
In the Hotchkiss drive, this torque member is the main leaf of the rear spring. In other drives, torque tubes are employed, or torque arms. The reverse takes place when the brakes are applied. In other words, the action is the same as that caused by acceleration except in the reverse direction. The brakes tend to hold the rear wheels stationary and the points of contact with the wheel and the ground tend to act as fulcrum points about which the entire rear axle housing revolves. This braking torque must be absorbed by the torque member, which may be either the spring, torque arm or torque rod.

The majority of American manufacturers have chosen a simple type of drive known as the Hotchkiss, in which the main leaves of the rear spring act both as the unit for transmitting the propulsion thrust as well as for receiving the torsonial action of the rear axle of braking or acceleration.

Only Two Cars Propel Through Radius Rods

As a matter of fact, there are only two cars which propel through the radius rods, and both of these are heavy vehicles. One is the Duesenberg and the other the Locomobile. There are eight or ten concerns which drive through the torque tube, these including the Dixie Flyer, McFarlan, Marmon, Revere, American Rolls-Royce, Stutz, H-C-S and Lincoln.

An important improvement which has been made during recent years in rear axle construction is the ability to adjust the mesh between the pinion and entire axle. A trouble which has been encountered, however, in some axles is that the locking of the adjustment has been insecure with a result that the adjustment has become loose at times and caused rapid wear of the pinion or even breakage of the parts. In one or two axles, this difficulty has been eliminated by giving a firmer setting to the adjustment part.



Rear view of Durant Six frame, showing how the use is made of muffler as an additional stiffening member. This frame also uses pronounced gussetts

Another detail improvement which has been adopted in heavier cars such as the Cadillac, is the use of a bearing on each side of the pinion on the pinion shaft. This axle, which has come to be known as the Cadillac type of Timken, has a taper roller bearing behind and ahead of the pinion on the pinion shaft. In other words, the pinion shaft is piloted ahead of the pinion, making a very rigid structure. Another feature of this axle is the extreme precaution which has been taken to prevent leakage of oil to the brake drum. The felt packing is squeezed firmly between two metal packing pieces and besides relying on the sealing ability of the packing alone, a reverse screw thread is cut in the axle shaft so that any oil will tend to be wound backwards toward the differential housing.

New Cars Incorporate Semi-Floating Axle

An important change which has been made in axle practice during the year is on the part of the Chevrolet, which up to 1921 had always adhered to the straight bevel drive, but the new model carries a spiral bevel pinion and a ring gear. In order to accommodate the greater end thrust on the pinion, an annular ball thrust has been added.

During the year there has been a marked increase toward the semi-floating type of axle. This is now used on 42 per cent of the makes, as compared with 34 per cent a year ago. The gains are practically all due to the new cars which have been brought out during the year, as there are very few instances of change-over from one type to the other.

The great majority of the new cars, however, which have been introduced during the year have incorporated a semi-floating type of axle. The new Wills Sainte Claire, for example, has a semi-floating axle. On this car there is only one universal in the drive, this being at the front end of the propeller shaft. It is an all metal universal of the yoke type. A torque tube of seamless steel tubing incloses the propeller shaft, which is connected with the driving pinion through a splined sleeve.

The differential assembly, including the driving gear, the four differential pinions, the differential spider and the differential side gears, is supported in the carrier by two double row ball bearings. Both the pinion and driven gear are adjustable.

The new Haynes car has a three-quarter floating rear axle mounted on Guerney ball bearings. The drive on this car is taken through the springs, but the torque and braking reaction is taken by a torque arm, which has been added in the new model. Formerly, the drive was a full Hotchkiss type.

The new Buick four also employs a three-quarter floating axle, with a single universal joint. This is enclosed within the rear end of the gearset housing and is lubricated from it. The axle has a malleable iron center housing. The final drive is through a spiral gear with nine teeth in the driving pinion and forty-two teeth in the ring gear. The bevel pinion shaft is mounted on two New Departure bearings and the differential gears are mounted on Hyatt bearings with a ball thrust.

Propeller Shaft Brake Gaining Favor with Many Makers. Improvements Noted in Releasing of Brakes

TYPICAL practice in brakes is to use the internal and expanding types on the rear wheels. This has, no doubt, been widely adopted because of the simplicity of the linkage, due to the fact that the brakes are both very close to the rear wheels upon which they operate, and because of the possibility of using a single drum.

Most engineers have been partial to the wheels as being the proper place, because it involves stress at the least number of parts and is hence considered to be safer. There are, however, quite a few who are considering the propeller shaft brake, and one newcomer into the ranks of manufacturers this year, the Duesenberg, employs four-wheel brakes, which are hydraulically operated.

There is very probably a tendency toward the installation of the foot or service brake on the rear wheel, and the hand brake on the transmission or propeller shaft. This has the advantage of providing two absolutely independent brake drums, so that, in case one breaks, it does not effect the other, and, furthermore, puts into the hands of the driver a very powerful emergency braking system. Because of the location of the propeller shaft, the brake has the benefit of the reduction through the rear driving system and also of the equalization secured by the differential gears.

The propeller brake, however, has its disadvantages. Those most frequently cited against it are the tendency to chatter, the excessive stresses which must be imparted to the universal joints and rear axle parts, and also the difficulty of dissipating the tremendous amount of heat absorbed by the small brake drum.

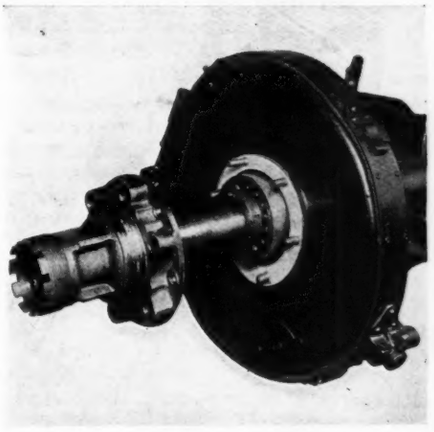
Naturally, the size of the brake drum is quite limited because of the location of the propeller shaft immediately under the floorboards of the car. In spite of these objections, however, by properly designing the brake, it has been found to give very satisfactory usage, particularly on the hand brake installation. It is to be found on the Maxwell, the Duesenberg, Westcott and other passenger cars, and in the truck field is very common.

Most Rear Wheels of Wrapping Band Type

Most of the rear wheel brakes are of the wrapping band type, because in the wrapping principle a maximum amount of brake resistance is secured by the action of the brake wrapping itself up in the band. Brake squealing is largely due to the concentration of the braking pressure on limited areas of the braking surface. These high spots or contracting points, being highly stressed, cause a chatter which sets up vibration, giving the noise.

An improvement which has been made this year is the increasing of the strength in the releasing mechanism on some of the brakes. Brake drag is very often due to insufficient strength of the releasing mechanism, or the releasing principles of the brake may not be adequate to insure a proper release of the brake bands from the drum when the brake pedal is released by the driver.

Brake actuating means are so well known that there is not much need for



The brake drum and hub arrangement as used on the Marmon

going into them in detail. Generally, on the external contracting type, there is a pivot anchor directly opposite the contracting mechanism. The brake segments are formed with eyes for the anchorage joints, or the steel bands have a fitting which is riveted to them to serve the same purpose.

The brake support consists of a bracket secured to the rear axle or to the radius rod. The contracting mechanism is nearly always a floating bell crank lever to the short arm of which one end of the brake band is connected by means of a riveted bracket, while the other end of the band connects through a short link to the fulcrum of the bell crank. The operating rod is connected to the long arm of the bell crank. The short link is hinged to the free end of

the brake band and passes through the fulcrum pin, the bell crank being forked at the lower end. A butterfly nut is screwed over the end of the link and provides a convenient adjustment.

The adjustment is locked by the spring surrounding the link, which forces the arms of the bell crank over the flat end of the wing nut, thus preventing it from turning. The coil springs at the same time help release the band when the pressure is taken off the brake lever. This method, while offering a simple and efficient means of applying the brakes, has also the advantage of providing a simple adjustment means. This is general practice on American cars.

Internal Expanding Brakes Either Cam or Toggle

The internal expanding brakes are generally either cam or toggle expanded. Practice on this point is about evenly divided. Considering the cam type, the internal shoes are pivoted opposite the expanding point. An expanding cam is

The Hudson double pawl and ratchet arrangement on the emergency brake lever

placed between the two flat surfaces or is contoured to fit a follower surface which permits of spreading the shoes apart to secure their contact with the drum.

The toggle expanding mechanism connects the ends of the two brake segments by a pair of toggle links, from the joints of which runs another link to a bell crank whose shaft has a bearing in the brake supporting bracket. Sometimes one or both of the toggle links are adjustable.

Where the propeller shaft brake is employed, the mechanism for its operation is very similar to the contracting brake on a rear wheel drum, the floating bell crank method of application being most frequently utilized.

An improvement which has been quite general where alterations have been made in the chassis during the year has been to lighten the pressure required on the braking pedal. On the Hudson, Cole, and other cars announced during the year, this has been given a special study. Most brakes are so laid out that a pressure of 30 lbs. on the pedal will lock the wheels. In the past, it has required considerable more pressure than this. The linkage ratio is generally finally determined by experimenting, and there is no set rule regarding it. The limitations are, of course, the length of the stroke available at the pedal, which, as a rule, must not be over 5 in., so that between the 30 lb. pressure figure and the 5 in. stroke at the pedal, the engineer is quite closely limited on his linkage layout.

Examining the cars which have been brought out during the year, one of the most novel installations has been on the new Lexington car. On this both the emergency and service brakes are unusual in their construction. The hand brake operates upon a drum located on the rear of the transmission.

The foot brakes are on drums attached to the rear wheels and in the form of contracting bands. The band brake is operated through a spring tensioning devise, so that it is possible to bring the car to a stop with very light pressure. The foot brakes are operated by a cable guided to each rear wheel by a heavy tube attached to the frame. The brake cables pass through loops or guides on the axle tubes and therefore are not effected by the slight rotation of the axle when the brakes are applied.

Duesenberg Hydraulic Four Wheel Brake

The new Duesenberg car employs a hydraulic four-wheel brake for the foot brake, and a transmission brake for the hand brake. On this car, the brake drums on the four wheels are forgings 16 in. in diameter. In order to obtain a perfect braking surface, the drums are ground. Circumferential fins are machined on the outer edges to provide strength with lightness and radiating surface. The four brakes are operated by hydraulic pressure. A master cylinder is connected to the brake pedal and the liquid is forced through the lines running to the four wheels by a piston in the master cylinder.

A small cylinder in each of the four brakes has a piston which is forced upward by the liquid entering the cylinder. The piston at the brake operates a toggle arm, which in turn expands the two brake shoes in each brake. All four of these brakes are operated simultaneously by the service brake pedal. An interesting feature of the brakes is that, owing to the floating arrangement of the piston and toggle, the brakes are self centering and consequently self equalizing. When the brakes are applied, they provide equal pressure against the drum. Water is used as the brake operating fluid in summer time and an anti-freeze solution in winter.

A change has been made on the Haynes car in that the brakes are now external and internal in place of the side internal brakes formerly employed. The brakes on this car are 16 in. in diameter by 2½ in. in width. The Haynes company manufactures its own rear axles. On the Hudson car a change was made to effect the ease of operation of the emergency brake lever.

In addition to greater leverage, the ratchet has been made heavier and the ratchet teeth larger. In order that this change does not effect the number of positions in which the brake lever may be placed, there are now two pawls employed which come into action alternately and give the effect of twice the number of teeth on the ratchet.

On the new Durant car, both sets of brakes act on drums on the rear wheels. The outside brakes are the service brakes and the inside the emergency, in accordance with usual practice. The brake drums are 12 in. in diameter, the inside being 1¾ in. wide and the outside 2 in. Each set is provided with a means of adjustment adjacent to the drum which can be operated without the use of tools. The cross-shaft for the brake linkage is located in front of the gearset, being supported by the same frame cross-member which carries the transmission and storage battery.

More Attention Being Paid to Ease of Gear Changing by Easier Operated Clutches

ALTOGETHER, there are four types of clutches being used in the 1922 cars. These being cone, plate, multiple disk and shoe.

Engineering and design changes in the clutches show more attention being paid to ease of gear changing because it is realized that the clutch pays a very important part in this operation. In the past we have had designs with heavy clutch parts where the inertia of the spinning member had to be overcome by fairly substantial clutch brakes. There is a decided attempt this year to reduce this inertia by reducing the weight of the spinning parts so that there is no longer any necessity for such elaborate clutch braking. This design trend supplies to all of the types of clutches because spinning exists in them all.

Cone Clutch

The cone clutch exists in American cars in two general types with a number of minor variations. The main types are the straight cone and the inverted cone. Originally, all cone clutches were faced with leather riveted to the male member, but the leather is rapidly making way for the asbestos fabric facings, which are rapidly gaining popularity. The facing of the cone clutch is a very important detail in the continued operation of the car.

It not only has to take the pull between the engine and the rear axle, but is also called upon to undergo a certain

amount of slipping just at the point of engagement, and a very slight slipping when the clutch is disengaged. In the leather facing trouble was experienced from glazing due to the slippage of the leather facing, trouble was experienced rim. The only remedy for this condition was an application of vegetable oil or Fullers earth. The organic constituents of the leather were not able to withstand a high temperature without disintegrating. On the other hand, leather possesses certain qualities which make an easier engagement than the asbestos fabric facings, and the leather is, therefore, retained by some.

Cone Clutch Engagements

Engagement methods on cone clutches have not undergone any considerable change. Ease of engagement is dependent first upon the angle of the cone face, and, secondly, upon either auxiliary engagement springs or a dashpot arrangement for slowing up the entrance to the cone.

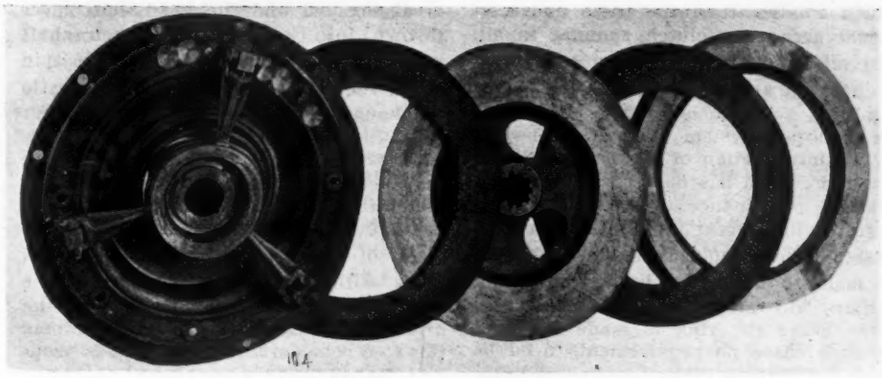
The clutch cone angle seems to have pre-definitely settled down to about 17 degrees, which is a compromise between a small angle, which would prevent slippage under load, and a large angle, which would permit of easier engagement, but would require a stronger spring to carry a full load. The auxiliary springs are practically all of the coil type spaced around the periphery of the cone and generally adjustable by means of a nut and stud. The latter acting as a guide for the springs. In some cases, the spring is contained in a shell.

The auxiliary springs make engagement with the cast iron flywheel surface before the main body of the facing, thus apparently taking up the load. The dashpot is contained in the center of the flywheel slip, and consists of a hole into which the shaft, a projection of the cone shaft, fits. There is a ball check valve which closes as the shaft enters the cylinder, and automatically opens as the shaft is withdrawn. There is necessarily some leakage of air past the shaft, and this leakage has to take place before the clutch has filled engagement.

Clutch on Cole Eight

The clutch on the new Cole eight has been improved in a number of details. It is still of the cone type with fabric facing, but it now requires materially less pedal pressure to release it and the cone is reinforced at the circumspect to prevent distortion. The clutch is equipped with a braking device which begins to function immediately upon the release of the clutch and automatically increases in effectiveness as the clutch is withdrawn farther. Its pressure can be adjusted as the case demands.

A maximum foot pressure of only 20 lbs. releases the clutch and provisions are made to lubricate the clutch release bearing through a tube located on the front of the bearing. This tube leads directly into the bearing and a few drops of oil squirted into it periodically will keep the clutch release lubricated.



Dissembled view of the clutch used in the Handley Knight. This clutch is of the plate type, the disks of which are shown in the illustration. The operating levers, also, are shown

Another improvement in the same clutch is the use of coil type clutch springs instead of flat springs, which were previously used. These are mounted in four cages and can be adjusted to give the desired effect. The clutch brake shoe is on a spring and the cone is flanged over with a stiffening flange at the rear against which the clutch brake shoe acts.

Plate Clutches

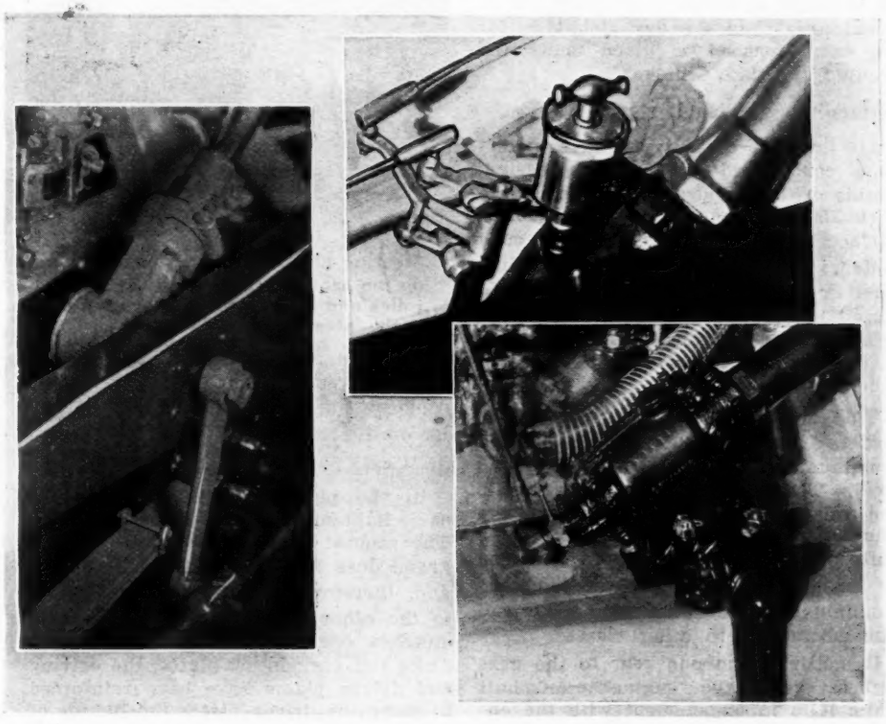
Another improvement is the relocation of the centers of the brake operating linkage. The inverted type of the pivot center below the center line of the axle is now used for the operating link, which, in connection with the Hotchkiss drive, gives maximum braking effect without chatter. The leverage is increased so that light foot pressure will apply the brakes fully.

The plate clutch seems to be gaining steadily in favor, although there is still some confusion in the minds of purchasers as to the difference between the plate and a multiple disk clutch. There has been some tendency to call a disk clutch a plate clutch, but the real definition of a plate clutch is one that has multiplying levers to keep the plates in engagement.

Of the many different designs in the present cars, the following are typical:

Steel against asbestos fabric.
Steel against molded asbestos.
Steel against bronze.
Steel against cork.

There is a strong tendency toward the dry plate type of clutch, and this tendency seems to be largely due to the fact that the parts, frictional area, etc., of a dry plate clutch can be made very



Left—A typical example of where the steering gear is mounted with a shaft extending through the frame. Right—A steering gear mounted on top of the frame channel. Above—The large grease cup used on the Dorris steering gear

much smaller than the parts and frictional area of a clutch running in oil. The oil film serves as a lubricant, which reduces the amount of friction and necessitates a very much stronger spring, or an elaborate system of multiple levers.

The introduction of the molded asbestos ring which has only come into commercial prominence this past year has resulted in a great refinement in clutch design. These molded rings or disks can be made to more close limits and do not require any stapling at the joint. In some cases the ring is made flat, and in such cases no replacements need be made until these disks have worn practically all the way through. There are no rivet heads to consider.

Dry clutches several years ago met with a good deal of trouble grabbing. No provision had been made in the design for ease and gradual engagement, but these details have now been pretty well worked out, and the dry clutch is now as free from grabbing as the clutch running in oil.

In conjunction with the area engagement methods, the dry plate clutch is comparatively longer lived compared to those of a few years ago, and it is said dry clutches are capable of going from 20,000 to 40,000 miles without replacement.

Multiple Disk Clutches

The multiple disk clutch has a greater number of disks than the plate clutch, each disk requiring multiplying levers to keep an engagement, is found both operating in dry and in oil. The greatly increased frictional services over the plate clutch necessitate such a strong spring, but the disk clutch running in oil is larger and has to have more frictional area than the dry disk type for the same reasons as given under the heading of "Plate Clutches."

Lightening Spinning Parts

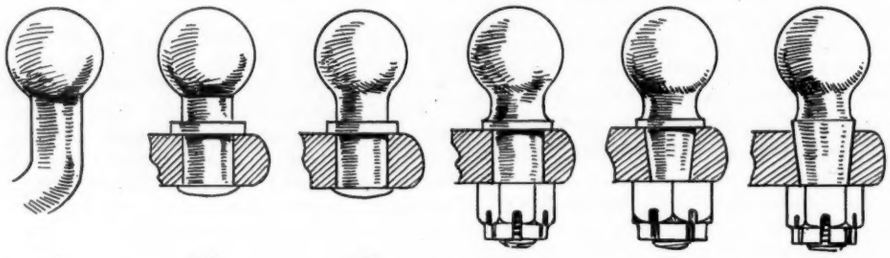
All three of these types have undergone considerable changes in design, mainly with the idea of lightening the parts between the actual engagement surface and the gear set. On the cone clutch, shaft, spider cone and facing, together with the necessary collars, pins, etc., it has been the practice in the past to make the spider of cast iron, although there were occasionally some made of aluminum.

This year we find many of these spiders lengthened by using webbed aluminum castings, or even pressed steel. There is still controversy as to the relative merits of cast steel and aluminum for the clutch spider. It is quite possible that the pressed steel can be made considerably lighter than the aluminum, but the aluminum may possess advantages in other classes.

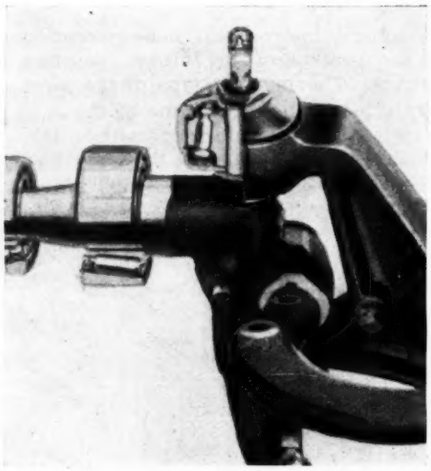
In getting from one gear to the next highest gear, the engine crankshaft while it is in engagement with the engine will be operating at a higher speed than the propeller shaft, due to the gear ratio in the gear set. When the clutch is disengaged and the gear shaft lever thrown into neutral, the clutch shaft with its own spider will continue to spin at the engine speed while the gear ratio is changed by changing into a higher gear.

Unless the clutch shaft speed is reduced approximately to the speed at which the mainshaft of the gear shafting is revolving at the time, there will be a clash of gears at the time of engagement with consequent damage to the face of the gears and annoyance to the driver. The clutch brake will overcome this to a considerable extent if it is properly fastened and proportioned.

The clutch brake operates automatically, changing as soon as the clutch is released. It is operated by bringing a friction surface such as fiber against some part of the spinning spider or collar on the rear end of the clutch shaft.



Various stages in the development of the ball on the steering arm of the Timken axle. The latest type shown at F is adjustable for looseness


Steering has been made much easier on the heavier types of cars by fitting roller and ball bearings to the top of the steering spindle as shown

Gear Sets

In the plate and disk clutches the same lightening of parts has taken place. The molded asbestos disk when disengaged does not become a spinning part and, therefore, its inertia is not added to the other revolving parts. In some clutches operating with alternate steel disks and cork insert plates, the driving and driven plates have been reinforced to make the driven plates the lighter of the two. The new Hudson design uses this means of reducing weight in the spinning parts.

The design of the gear set has undergone very little change in the past couple of years, except that there is more of a tendency to mount the countershaft on ball bearings instead of bronze bushings. Several makers are getting away from the unit plant idea, and mounting the gear set separately from the engine and clutch which, however, are continued as one unit. The new Durant has the gear set mounted separately on two cross frame members with a short shaft with two universal joints between the gear set and the clutch.

These universals are fabric and by removing a few bolts in the universals the shaft may be taken out, making it possible to remove the clutch parts without disturbing the gear set. Similarly, by removing the bolts from one of the fabric universals from in front of the gear set and back of the gear set and the gear set itself may be removed without interfering with any other units. The unit power plant still is the more popular form of assembly and the introduction of several separate mountings may or may not mean a tendency in this direction.

Universal Joints

The fabric type of universal joint has gained great headway during the past year, and quite a large percentage of the models to be made for 1922 incorporate one or more of this type in the design. The popularity of the fabric universal joint is due to a large extent to the poor lubrication methods used on many of the form metal universal joints.

The lubrication system in some cases were designed correctly enough, but when assembled in the car they were not within observation of the owner or driver and consequently received but scant attention, and this could result in only one thing and that was rapid wear with its accompanying knocks and lost motion. Some of the molded universal joints have been very much improved in this respect, and the Lincoln, for instance, makes provision for lubricating front universal from the front gear case.

Propeller Shaft

The elimination of the old leather boot for surrounding the universal with lubricant has given way to the metal universal cover. This can be very tightly fitted and makes a neat and lasting

cover to keep the lubricant in and keep dirt and grit out.

The tubular type of propeller shaft is making rapid headway and the divided type has been eliminated in this year's designs.

The Wills Sainte Claire clutch, which is of the multiple disk type, has a disk made of asbestos cord with strands woven into the disk. The advantage claimed for this construction is that with the asbestos cord lining, the surface is built up of a number of cords placed along side of each other. When the clutch is thrown in, the top of the cords come first in contact with the unlined disk and then flattens out as the pressure increases giving a smooth engagement.

The clutch employed in the new Hudson super-six while fundamentally the same as in previous models, has lighter rotating parts. The gear shaft is continued forward and forms the clutch shaft, eliminating the three-jaw slip joint used formerly as the connection between the clutch and transmission shaft. This shaft has a pilot bearing in the flywheel and carries the driven disk in a die cast aluminum drum.

These driven disks are light, thin disks and do not carry the cork inserts which are now in the driving disks. Formerly the driven disks carried these cork inserts and were the heavier of the two sets. This drum also carries cup-shaped inserts which act as the clutch spring retainers. There are eight of them spaced equally about the aluminum drum, giving uniform pressure on the bearing surfaces of the disk. The clutch spider depresses these clutch springs showing disengagement.

A more positive separation of the clutch plate is insured by small springs placed between the clutch disk. The use of these springs prevents any tilting of the disks.

The clutch throwout grease cup used in previous models has been eliminated and a large annular ball throwout bearing automatically lubricated by the oil in which the clutch runs is now employed.

Present Tendency Is for Mounting Heavier Steering Gears. Three Types, Worm and Wheel, Worm and Sector and Traveling Nut in Vogue

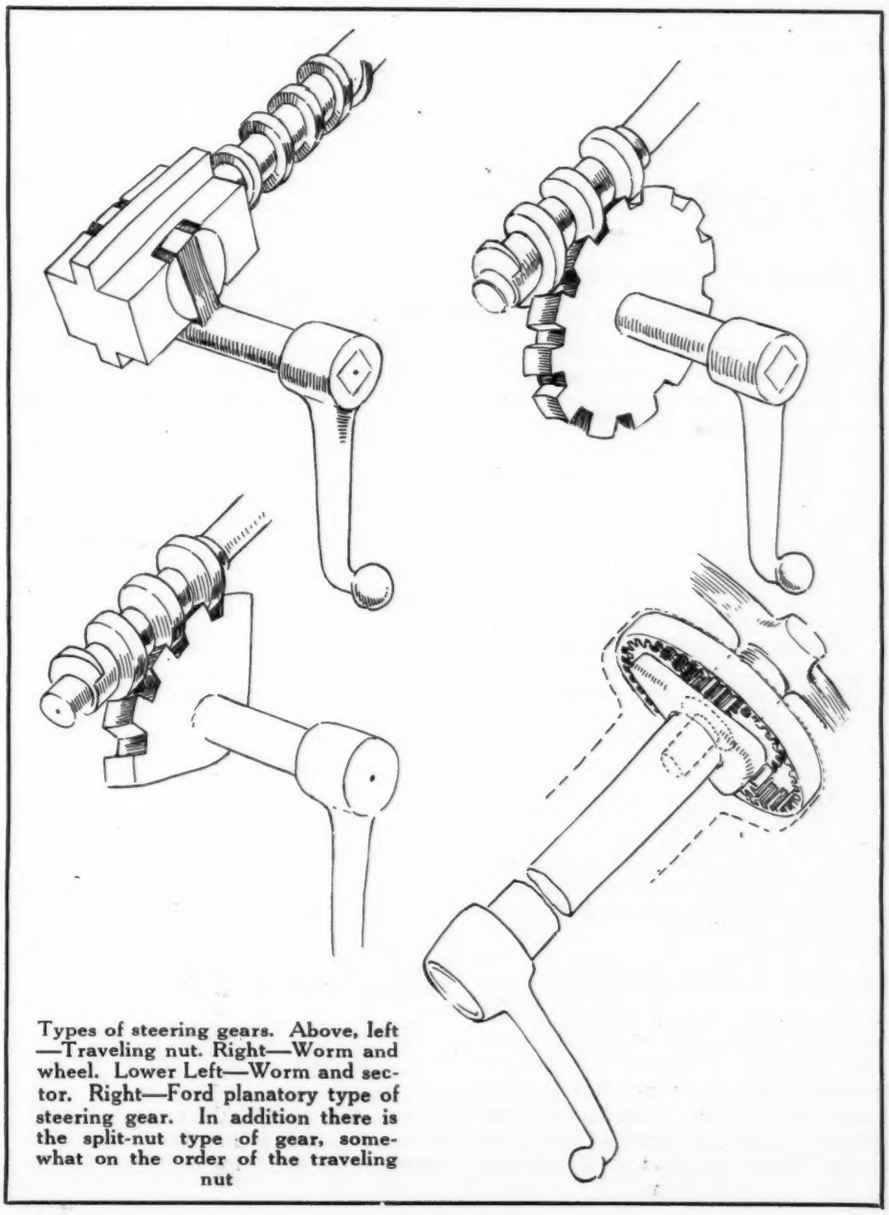
WITH the exception that better design, material and workmanship is being applied to steering gears, there has been little change, practically speaking, in their general makeup. There is a tendency to use a heavier and more sturdy steering gear on the part of many car makers. This change has been extending over a period of years, and so we find none of the older altered much in this respect. But the newer models have been noteworthy for the installation of gears which are heavier and stronger than those which have been installed on cars of the same weight in the past. As an example of this the new Rickenbacker car might be cited.

One of the reasons why a heavier gear has come into general use during the past few years is because of the parking difficulty in the larger cities. The difficulty of parking in a narrow space at the curb means that at times a car under such conditions will have its steering gear subjected to heavy stresses, because the car may be stationary or just moving when the front wheels are cramped to their limits to the right or left. These are strains which never would be encountered in ordinary driving.

More Rigid

The result is that the steering gears in the cars of today have been made more rigid from the steering wheel itself to the ball arm operating the drag link. This has eliminated twist and spring in the parts and the result is that there is no evidence of binding in the bearings. The binding of the steering gear, due to being sprung out of shape while attempting to turn the wheels of the car while it is stationary has been one of the defects of some cars in the past.

In connection with hard steering it might be of interest to mention here that the tendency on the part of most car makers to use a more rigid frame for the chassis has had its influence on steering. Frame makers have stated that in the past some car makers saw fit to use too light a frame and often one on which the front cross member was set too far back. Unless such a frame was stiffened at the front end with a tubular cross bar the frame was likely to weave and thereby set up a decided



Types of steering gears. Above, left —Traveling nut. Right—Worm and wheel. Lower Left—Worm and sector. Right—Ford planatory type of steering gear. In addition there is the split-nut type of gear, somewhat on the order of the traveling nut

unpleasant wobbling of the front wheels. Car frames today have more cross members as a general thing and with the tendency for bracing the front of the frame with a tubular cross bar it is certain that it will have its beneficial results on the steering of the car.

One of the main difficulties encountered with steering gears and their tendency towards stiffening up under usage is simply that of poor lubrication. This does not apply so much to the steering gear itself as to the drag links and cross-arms. Neglect on the part of the owner to take care of these units has caused stiffness in their action, which has often been blamed on the steering gear. The tendency toward the use of oil lubrication for these parts has helped to overcome this difficulty, as it has been noted that owners will oil the car where they will fail to grease it. A great many cars, however, still employ grease cups on the drag link and cross-arm parts, although they are using oil cups in other places.

Steering gears in general use are of the worm and wheel, worm and sector and the travelling nut types. These are illustrated on these pages. Improvements have been made in the mounting of the drop arm or ball arm on the end of the cross shaft of the steering gear by the use of splines. Heretofore it was common to fit the arm by means of a square opening to a squared end of the shaft. A clamp bolt held it in place. The object here was that play developed sooner or later and was hard to take up.

One of the features to recommend it, however, was that the arm could be removed readily and when necessary the worm wheel could be turned partly around and the arm mounted in a new position, thus taking up the play which had developed at a certain point in the worm wheel.

Latest Method for Mounting Arm

The latest method for mounting the ball arm is by splines. In one gear the end of the trunnion shaft has thirty-six 90 deg. taper splines machined on it to insure a correct setting of the ball arm when the latter is pulled into place.

In speaking of the ball arm it is interesting to note the evolution of the ball itself. Take the ball on the steering knuckle of the Timken axle, for example. A few years ago all the axle makers merely bent up the end of the steering arm and turned the tip into a ball, as shown at A in the sketch. There were several reasons why this was not the best practice. The arm had to be elastic and the ball very hard to resist wear. Thus different heat treatments and different steels were required because the arm and the ball had different duties to perform.

Therefore, there was developed a steering ball with a straight shank and fitted snugly into the hole in the steering arm, as shown at B. The lower end of the shank was riveted. It was noted that when a break occurred it always took place at the bottom of the ball, so the ball was made with a fillet as shown by C. After that there were fewer breaks, but these came just above the collar, so the shank was enlarged and tapered towards the collar so it looked as in D. A castellated nut below replaced the riveting.

Continued hard use of the vehicle made it necessary at times to tighten the ball. So, in time the shank was tapered in order that it might be drawn down to a tight fit and could be drawn further down as vibration caused some looseness and wear. This construction is shown at E. Eventually, there came a time when the shank could no longer be tightened owing to the fact that the collar butted against the steering arm. Therefore, the angle of the taper was increased and the collar left off. There is practically no limit on the amount of adjustment with this kind of a construction, indicated at F.

One of the features which is making for easier steering is the use of ball bearings in the steering knuckles. The weight of the forward end of the car rests on these points and consequently any binding or friction at this point makes the vehicle very hard to steer. The use of anti-friction bearings at this point on heavy cars is particularly desirable and is being increased.

Smaller Wheels in Evidence on the New Models. Disk Wheels Making Considerable Headway. Wire Wheels About Holding Own

THE artillery type of wood wheel still holds preference with the car makers of this country, over fifty manufacturers using it at the present time. While this is true it is equally true that other types of wheels have gained in favor and in this connection mention must be made of the disk wheel.

It now is possible to get disk steel wheels for practically every make of car and two makers are furnishing them as regular equipment, Wills Sainte Claire and Maxwell, although in the latter instance the disk wheels are optional at the same price as the wood wheel.

It is quite the thing now for car makers to furnish their sport models with disk wheels and it usually is on these cars where this type of wheel shows up to best advantage, so far as looks are concerned. Easier riding qualities, rapidity of wheel change, and the ability to keep them clean very easily are some of the major things claimed for the disk wheel.

Disk Wheels and Tire Changing.

While on the subject of disk wheels mention might be made of the wood disk wheel recently developed. The wheels are made from the same grade of wood as used for airplane propeller and are laminated in such a way that the grain in each lamination runs in a different direction. These wheels are claimed to be of about the same weight as spoke wheels, but to have four times the lateral strength.

With many of the disk wheels it is not necessary to carry a spare, only a rim being necessary. On others the entire wheel is changed and it, therefore, becomes necessary to carry an extra wheel for tire change.

There has been a tendency of late to reduce the wheel diameter on cars. Cadillac is a good example of where this has been done. This car now uses 33 by 5 in. tires where formerly the tires were 35 by 5. The lowering of the car by the use of smaller wheels is reflected in the general appearance.

At one time there were many who said that the 31 by 4 in. tire was not a popular size and could not be made in the cord type of construction. Today we find this size of tire apparently coming to the front, Buick, Maxwell and Dort now are using this size tire. This requires a wheel of only 23 in. in diameter and naturally makes for a strong construction.

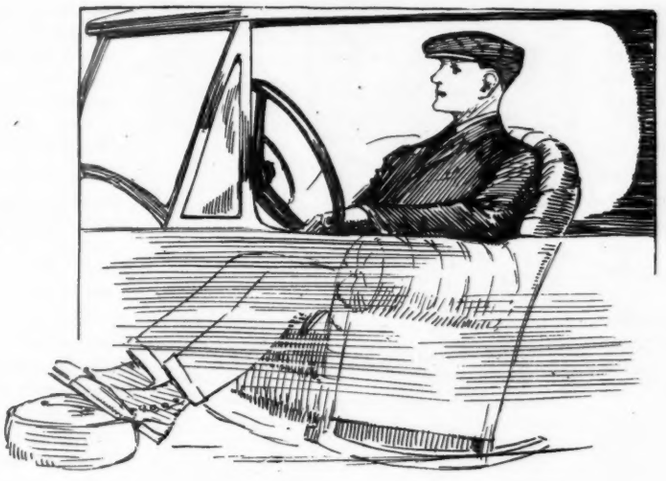
The tendency for smaller wheel diameter is probably largely due to the fact that smaller and snappier engines are used in our cars today and to get good acceleration and performance, which the American car owner seems to want, it is necessary that the wheel diameter be not too large, because of the fact that it takes much longer to set a wheel of large diameter in motion.

The wire wheel still remains popular with many makers and is fitted as stock equipment or as optional equipment on over thirty cars. The disk wheel, however, has cut in on the wire wheel to a large extent, especially due to the fact that the wire wheel is more difficult to keep clean and to keep the spokes properly tightened. With the particular method now used of lacing wire wheels there is the danger of cutting spokes when the car is driven too close to the curb.

Easy Riding Qualities Claimed for Wire Wheels.

Easy riding qualities always have been claimed for the wire wheel and this is largely due to the fact that the weight is centered in the hub and that the car weight is suspended from the top spokes, whereas in the wood wheel the weight is taken on the spokes at the bottom. Road shocks, therefore, are more readily transmitted through the wood spokes to the hub of the wheel than in a wire wheel. With a wire wheel, it is claimed acceleration is much improved because the wheel is set in motion easier by virtue of the lighter rim.

MAKING *the* OWNER MORE *at* HOME



NEW Cars Fitted with Bodies Representing Last Word in Coachbuilder's Art. Seats Are Lower and Better Windshields Are Fitted. Upholstery of a Higher Grade Material. Attempt to Standardize Body Hardware.

THE 1922 season brings with it no radically new body designs. The outstanding feature of the body situation is the continued increased demand for enclosed cars. Although each succeeding year since 1915 has seen an increase in the production of enclosed bodies for practically every manufacturer, the year just passed showed the greatest increase and there is a possibility that the demand in 1922 will show a material increase over 1921.

There is an insistent and growing demand for a low priced enclosed car and it is pretty generally recognized that the chief obstacle in the way of the sale of enclosed cars is the considerable difference in price between it and the open models. In spite of the relatively high price of the enclosed car, the sale of this type has increased very greatly during recent years. In 1919 enclosed cars comprised 10 per cent of the total production of the country, and in 1920 this percentage had risen to 17 per cent.

Looking back over the history of the automobile, we find that the car owner considered first the conveyance features of the vehicle. Later he begins to think about convenience ,and the result is some kind of a top to protect him from the rain. Later, this top was made into a folding form so that it could be lowered during pleasant weather. In those days it was quite the thing to drive the car with the top down, unless rainy weather necessitated its being raised. Today practically no owners drive with the top down. The difficulty of properly fitting side curtains to the touring and roadster types has led to the introduction of permanently fixed tops as exemplified in the sedan, coupe and other enclosed types, and also the California top, which is a permanent touring car top with partial sides.

The fallacy existing in the minds of many owners that a sedan or coupe was unbearably hot in summer time has been thoroughly exploded and it is now a pretty generally recognized fact that an enclosed car can be made just as cool in summer as any open car. The enclosed car, therefore, ceases to be a winter utility and becomes an all-year-around necessity.

The automobile has now taken its place very definitely as a utility vehicle, and a majority of users need an all-year car. Many others, even those who use cars primarily for pleasure purposes, desire such a model. The chief obstacle stand-

Enclosed Car Prices Compared to Touring Car Prices

	Coupe	Sedan
CARS UNDER $1000		
1920 Prices	61%	83%
1921 Prices	56%	65%
CARS $1000 TO $2000		
1920 Prices	48%	55%
1021 Prices	49%	62%
CARS $2000 TO $3000		
1920 Prices	36%	43%
1921 Prices	39%	49%
CARS OVER $3000		
1920 Prices	23%	29%
1921 Prices	24%	31%

Essex Coach, 25%

The tabulation of coupe and sedan prices compared to touring car prices discloses that in the cars under $1000 the increase in price is approximately half that of the increase in price of the cars over $3000. Incidentally, it is interesting to note that with the reduction of price of cars during the past year the percentage of the enclosed cars has actually increased about twelve per cent on the cars under $1000. and two per cent on the cars over $3000. The above tabulation is made up from a representative list of cars in each class.

ing in the way of still greater demand for enclosed cars is the differential in price between the open and enclosed models.

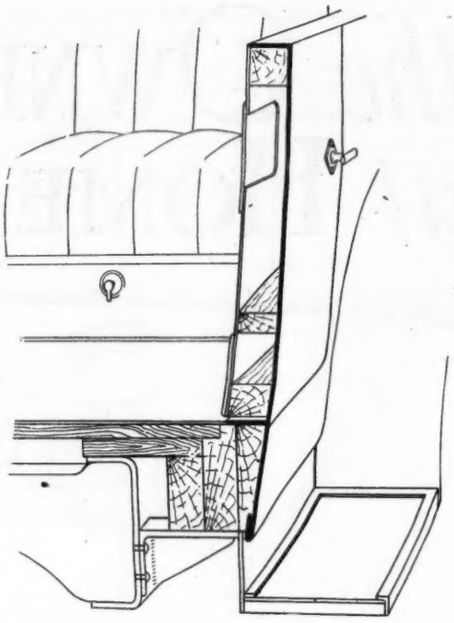
Many Need All-Year Car

This price differential varies in the different price classes, and on chassis which are in the $3000 and $4000 class there are many cases where the enclosed car costs twice as much as the open car. In the lower priced classes, say under $1500, there is not such a great differential, but the figure is still quite high.

Probably the first big effort to overcome this high differential is seen in the Essex coach, which has been built especially with the idea of furnishing a thoroughly utility vehicle at a price not very considerably greater than the open car. The low price has been made possible by production methods rather than by hand fitting methods which have been in vogue practically since the beginning of enclosed body work.

It is rather odd that with the wonderful production methods of the American automobile factories it has been unable to put enclosed body jobs through on production schedules. Chassis detail, production methods and factory tooling have been worked up to a point where practically no fitting is required in the assembly of the chassis, yet when it comes to putting enclosed bodies together, every job becomes practically a custom built job and includes a lot of hand work and fitting, whereas proper production methods would eliminate the necessity for any of this sort of thing.

There will always be a class of buyers, of course, who will demand de luxe closed bodies and fine coach work, but this class does not include the great mass of automobile owners who comprise the market for volume sales. They want a lower priced enclosed car, and to get it are willing to forego a piano finish and curves in the body and roof which hark back to the middle ages for their origin.



Frame construction on the National. Showing how a lower body has been secured by mounting the sills on side brackets

Simpler body designs will result in simpler construction methods. These, in turn, will bring about standardization and interchangeability and, consequently, less body service problems.

Not So Many Runabouts in 1922

A general survey of the field indicates a strong belief in the possibilities of reduced cost in enclosed body construction. Body designers and production men will have to cooperate and experiment together to solve the problem. It is almost certain, however, that the body production man is going to play a larger part in body design than he has in the past.

The 1922 season will see still less of the two-passenger roadster or runabout, as it is sometimes called. The decreasing popularity of this type is due to two things. One of them is the demand for an enclosed car where the purchaser requires a vehicle of this seating capacity, and the other is due to the introduction of the sport type, or so-called racers. The difference in price between a roadster and a touring car in most cases is the same, or if there is any difference at all it is quite small. The two-passenger roadster is more or less ungainly in appearance, being rather too high for its length, unless it is given an added length effect by a large rear deck or an extra long hood, as in the case of the racy types.

Increase in Sport Type

On the other hand there is quite a considerable increase of the sport type, four-passenger roadster. This type is largely the outgrowth of a type that was first called a clover leaf or close-coupled roadster.

The 1922 season sees the entire elimination of the convertible enclosed car, which was first brought out about 1912. The mechanical difficulties in the way of preventing squeaking, rattling and other undesirable features were practically unsurmountable, and it was also found that when once the enclosed top was on, the owner did not have any desire to take it off again.

The popularity of the California type top is still increasing, and many manufacturers at the present time are offering this type of top as an option on their touring models at a slight additional cost. Making a regular touring top into a top that would resemble the California top has failed because the side curtains with the round windows formed a blind spot for the driver in backing his car and it was necessary for him to stick his head out of the side of the car in order to see what was in back of him.

Several manufacturers are encouraging the dealer to furnish custom-built jobs on town cars, limousines, etc., and are furnishing the dealer with chassis for this purpose. The prospect for this kind of a vehicle is not generally confined to any certain price and can more often be suited with a custom-built body than with a stock body which would have to be average requirements rather than special requirements.

Lower Bodies Designed

The tendency on the whole is to get bodies lower. In some cases this lowering is accomplished by changes in the body itself, such as changing the construction so that the body rests on the lower sill of the frame rather than on the upper sill, and in other cases, chassis changes have been made so that the whole car is lowered without materially changing the construction of the body itself. On many of the new cars it is possible to stand on an ordinary curb and look over the top of the car, while others are just a few inches higher than this. Lower wheels and smaller tires are partly responsible for this reduction

How the curtains are carried in the back of the front seat on the Rickenbacker. This affords a very convenient location for them

in height and some of the old cars, such as American, Locomobile and National, which had the large 40 and 42-in. tires, tower over the lower cars of 1922.

Comfort Features

In both the open and enclosed bodies more attention is being given to the comfort of the driver and the other occupants of the car. There is a very noticeable increase in leg room, especially in the driver's compartment. On many of the previous models the placing of the pedals, levers and steering column was such that the driver had to be more or less of a gymnast to get into his seat, especially from the right side of the car. Rearranging many of these details has resulted in not only more leg room, but a cleaner floor.

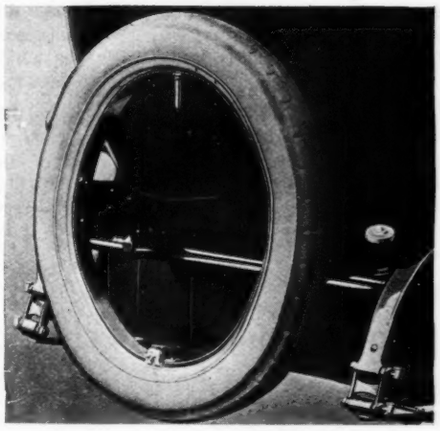
The seats themselves have been given a great deal of attention, too, and the 1922 car will find many models with the seats slanted and closer to the floor. Another feature of the seat is the curvature of the upholstery to fit the driver's back. Much attention has also been given to drumming on enclosed cars. This drumming is due to vibration of parts that are resonant, and every effort has been made to eliminate this feature. The use of felt and other sound-deadeners in the top has almost completely eliminated this fault of the enclosed car, and practically all makes, from the low-priced to the high-priced will be found much better in this respect than during the past two or three years.

Windshields Given Serious Consideration

Windshields on both the open and enclosed models have been given serious consideration. The great drawback to the rain vision windshield, the impossibility of keeping the joints between the two glasses rain-tight has been largely overcome in this year's models.

The frames of the windshields are made heavier and the fastenings from the top part of the windshield to the top on the open cars is a more permanent form. In some cars the butterfly or wing nuts which were formerly used to attach the windshield to the top are replaced with hexagon nuts and lock washers. On the Paige 6-66 there is a side member on each side of the windshield of triangular form built in with a small glass pane. This side functions both as a better support for the windshield and for getting a vertical attachment piece for the side curtains. The problem of attaching side curtains at the front of the windshield so that they will not flap and so they will keep out rain and wind has been a problem. On the Studebaker big six this is taken care of by a small triangular section of curtain which can either be left on or taken off the car at the driver's option.

In the seven-passenger cars the auxiliary folding seats have been improved in design so that they operate with more ease and are more substantial, and at the same time the upholstery has been increased in thickness, thereby giving additional comfort. The layout of the tonneau is practically unchanged. Several cars have introduced lights of one kind or another to illuminate the rear compartment.



Much attention has been given to improving the tire carrriers. This shows the new Chandler construction

Steering wheel columns are very much better supported than in the past. It was one time the custom to bring the steering column flange to the floor board or toe board and leave it either unsupported to the wheel or clamped to the instrument board with a strap. On many of the 1922 cars the column is placed in such a position that it is entirely hidden from the ordinary range of vision, either coming through the instrument board or coming out at the lower edge.

In such cases the actual steering column lengths from the instrument board to the spider will vary from a few inches to 8 or 10 in. More careful attention to the layout of the driver's compartment has resulted in the elimination of the tilting steering wheel on the Cadillac model 61, and several makes have eliminated adjustable pedals, which were considered necessary in the past.

Several makes of cars have changed the location of the starter button and placed it out of reach of the person stepping into the car. It has been the experience that when the engine was running this button was often stepped on, causing the pinion to slide in against the rapidly revolving flywheel teeth, either stripping the teeth or bending the pinion or shaft. The location of the button well up on the toe board has eliminated this source of trouble.

The storage of tools, equipment and luggage under the seats of the car has always been an annoyance to the owner and the use of rear decks for this purpose has simplified internal arrangements and has also made possible the lowering of the seats to a greater degree than was heretofore possible.

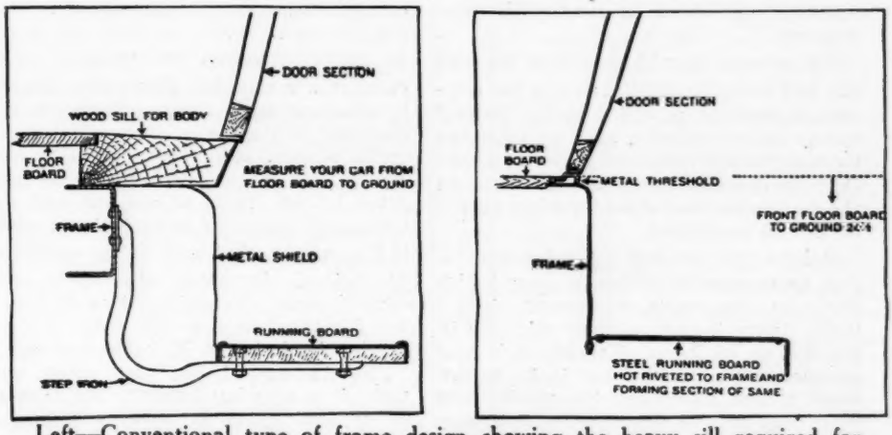
Convenience Features

The stowing of curtains has always been somewhat of a problem and several new ingenious methods for taking care of these have been worked out for 1922 models. One maker has a pocket in each side door of the touring car which contains the curtains which go immediately above this door and another make has a space in back of the back seat cushion so that the curtains can be laid out practically flat. Other makers utilize the back of the front seat for a curtain receptacle. The use of plate glass for the rear windows is almost universal and even extend to odd shapes which are more or less of a trade mark of the car.

An innovation in enclosed car upholstery covering is seen in the detachable type by means of which the coverings can be entirely taken off the cushions, backs, etc., in a very few minutes and sent to a dry cleaner so that all dirt, dust, grit and grease can be removed. With the permanently attached coverings, this was impossible and it is now much easier to keep the interior of an enclosed car in good looking shape than with the permanently attached type.

Standardization of Body Hardware

A distinct attempt to standardize body hardware is seen in many of the 1922 cars. It has been extremely difficult in the past to match door handles, hinges, and other hardware, especially on custom-built jobs, and a standardization of this hardware and the placing of it on the market or in the hands of dealers and distributors is a distinct advance in this end of the body business. Door alignment is generally taken care of by a tongue on the door which fits into a slot on the door sill. This allows the latch of the door to go exactly in line



Left—Conventional type of frame design showing the heavy sill required for mounting the body. Right—How a lower floor board is secured by use of the Z type frame

with the keeper and also prevents the sticking of the door at the bottom. This is especially important in the case of enclosed body doors.

The hood lines are made higher and narrower this year, the radiators being made the same shape to conform to the hood contour. At least two manufacturers are using inverted louvres in the hoods, which gives a somewhat different appearance to the side of the hood and is claimed to produce very satisfactory ventilating effects. In some cases where the cowl is fairly high, a one-piece windshield is adopted and as this has no ventilating features, a ventilator is put either on the top or the sides of the cowl.

The starter switch on the Earl and Haynes 75 is on the dash.

Cars Now Coming Through in Production Much More Completely Equipped Than Formerly

There has been a tendency to clean up the floor boards in some cars and place the controls on the dash. This shows the starter button on the Haynes

VERY often the purchaser of, or prospective purchaser of a car is influenced by the attention which the car maker has given to the equipment of his product. The average car buyer does not know so much about the mechanical constructions that enter into the motor car, but he does appreciate refinement of detail and care given to those appointments which he can readily comprehend.

The average car buyer drives his own car and therefore must perform the common operations occuring in the general use of motor vehicles, such as changing tires, replacing lamp bulbs, etc. It seems that on the new cars there is much in the equipment that should quickly appeal to the car purchaser.

Makers now are coming to the conclusion quite generally that it pays to include in the car's equipment, better tools. There is now a better selection in the matter of jacks. Heretofore it was common for a car to have in its equipment a jack altogether too small. The same was true of wrenches and similar tools. Several car makers now construct one of the forward doors with a compartment for tools and where this is done it generally has been followed by the maker furnishing a high grade quality of tools.

Making Tire Changing Easy

As long as tires have to be changed on the road at times, the car owner must carry a spare and the method of mounting this spare should be such that it can be readily removed and replaced. Tire carriers are stronger than those formerly used and more firmly attached to the rear part of the frame. Cars which carry spare wheels, either wire or disk, generally have some sort of dummy hub fitted to the frame of the car and the process of removing or replacing a spare is the same as that used on the car hubs. In several instances the spare tire carrier forms an additional cross member for the frame at the rear. An example of this is the Rickenbacker car.

Examination of the cars show that there is a growing tendency for makers to fit side lights or parking lights to their cars. These are useful in that they consume very little current and where the parking light is mounted on the left fender it shows an oncoming driver exactly the width of the car when the latter is parked at the curb.

Wills Sainte Claire Courtesy Light

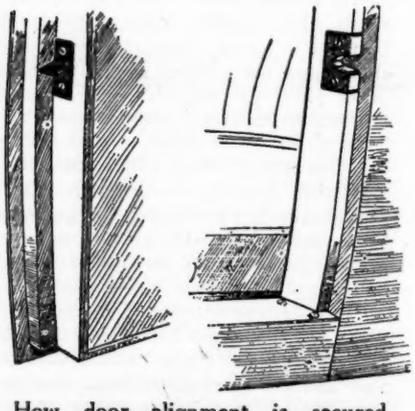
The side or courtesy light on the Wills Sainte Claire is unusual. This is mounted on the left side of the body in line with the windshield post and at the height of the fender crown. The light has a 21 cp. bulb and throws a beam directed downward and backward.

The purpose of the side light is to illuminate the left side of the road to protect the passengers while entering, leaving or standing alongside the car at night, and to show clearly to approaching drivers how much clearance they have while passing. In addition to the tail light there is a backing light combined with it, which is automatically switched on when the car is thrown into reverse.

Practically every maker now has fitted the speedometer drive to the gearset, which makes for a much cleaner installation and less trouble. There also has been a better grouping of the instruments on the dash. Instead of spreading the instruments from one side of the dash to another many cars are coming out now with the instruments in combination, or centrally grouped. This makes them easier to read and also affords a neater appearance. Cadillac is an example where several instruments like ammeter and pressure gages are grouped under one glass to correspond with the speedometer and clock set in another circle of the same size.

Reducing Number of Keys for Locks

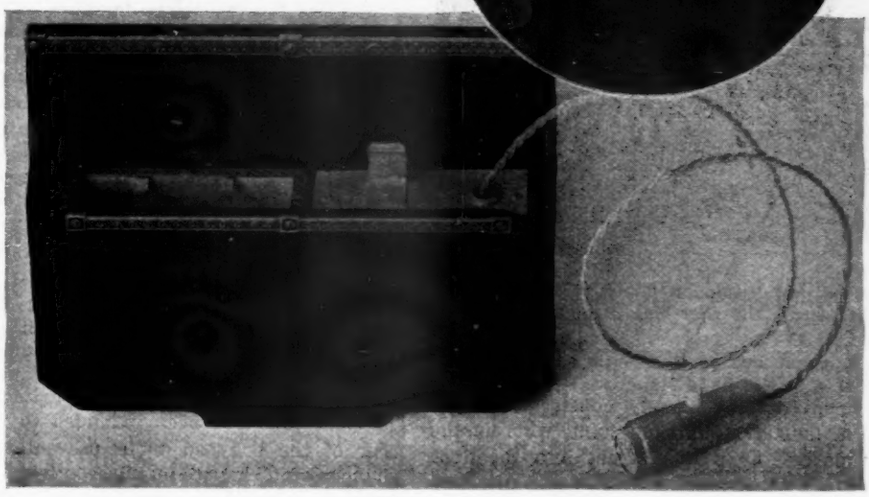
There has been some tendency to reduce the number of keys required to lock the various units on the car. Thus some makers are equipping their cars so that a single key locks the ignition, gearset and spare tire. Quite a few makes of cars are coming through with transmission locks as standard equipment. In several instances the locks are protected against dirt by small covers which can be slipped out of the way during the



How door alignment is secured through the use of metal mortise and tension joints

process of unlocking. Marmon has a gearset lock located in the ball of the shifting lever, which is very accessible.

Most of the cars are coming through with some form of patented lens in the headlights to conform with various legislations in the different states. In regard to lamps there has been some improvement made in the matter of focusing the bulbs and the manner of removing the lenses or lamp covers for gaining access to the bulbs or reflectors.



No closed car is complete these days it seems without the above luxuries consisting of a vanity case and smoking set

The Old Bugbear, Rattles, Has Been Given a Severe Jolt in the New Cars

ONE of the first things about which the average car owner complains is squeaks and rattles and outside of the high priced cars these two items stand out more or less prominently in the servicing of automobiles. It is, of course, to be expected that a vehicle which is subjected to as severe use as the modern motor car will wear at certain points, especially when such wear is hastened by atmospheric conditions, road dust, rust and general neglect on the part of the car owner.

Generally speaking the squeaks and rattles can be classified under two heads, chassis and body. Under the first heading might be included such things as brake rods, spring shackles, fan mounting, torque arms, fender supports, lamps, running board mountings, etc. Under the heading of body rattles we might include such things as doors, windshields, hood, fenders, hood latches, body framework, etc.

As was pointed out recently by a body engineer, one of the chief causes for squeaks in a motor car is that of moisture finding its way into the joints of the woodwork which constitutes the frame of the body, and loosening them sufficiently so that play sets up and in dry weather, especially, these surfaces rub just sufficiently to set up a disagreeable squeak.

This is true largely of such bodies in which in the mortise and tenon or halved joints of the woodwork are put together with an insufficient amount of screws. There have been cases where such joints have been put together with glue and nails only, and naturally such a joint cannot be expected to give satisfaction.

In several of the high priced cars a process in making the body is followed which might be adapted even to the medium priced field with satisfaction because of the excellent results obtained from this practice. Briefly, the process is that of painting the wood frame of the body before any metal covering is put on. This is assurance against any moisture getting into the joints and loosening them.

Greater care is now given by most makers in the mounting of the body on the chassis frame. Heretofore, it was common to use some sort of packing material between the sills of the body and the steel frame in a limited quantity and at certain points on the frame only. In the cars now produced many makers are making a more lavish use of this anti-squeak material and in several instances have doubled the thickness.

Cole is a good example of this. Here welted anti-squeak material is used between all sheet metal parts and a thick, wide cork anti-squeak packing is used between the body and frame. The proper insulation of the body from the frame constitutes one of the most important things in the elimination of squeaks because just as soon as there develops any movement between body and frame, usually caused by the body holding down bolts loosening, there is sure to be a series of unpleasant squeaks set up.

Many of these are hard to remove, especially if the anti-squeak material is very thin and tightening of the body bolts is often only a temporary relief. The real solution is heavier and a more lavish use of anti-squeak material, and this it is gratifying to note, is what most of the makers are doing today.

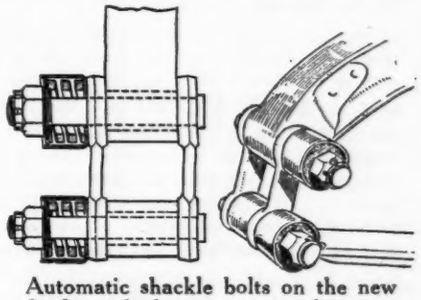
Biggest Cause of Rattles

Coming to the chassis itself, probably the biggest cause of rattles is that produced by wear in the spring shackles. A shackle is in motion practically all the time and owing to the fact that its motion is not a continuous rotary motion as regards the bolts holding it together, its lubrication becomes one of the greatest problems we have. And, to this must be added the carelessness of the average car owner who neglects to lubricate such parts as shackles, steering arms, drag link, etc.

But the manufacturer is beginning to realize more and more the tendency of the average car owner to neglect these parts and is therefore building his product after such a fashion that this neglect will not materially affect the part.

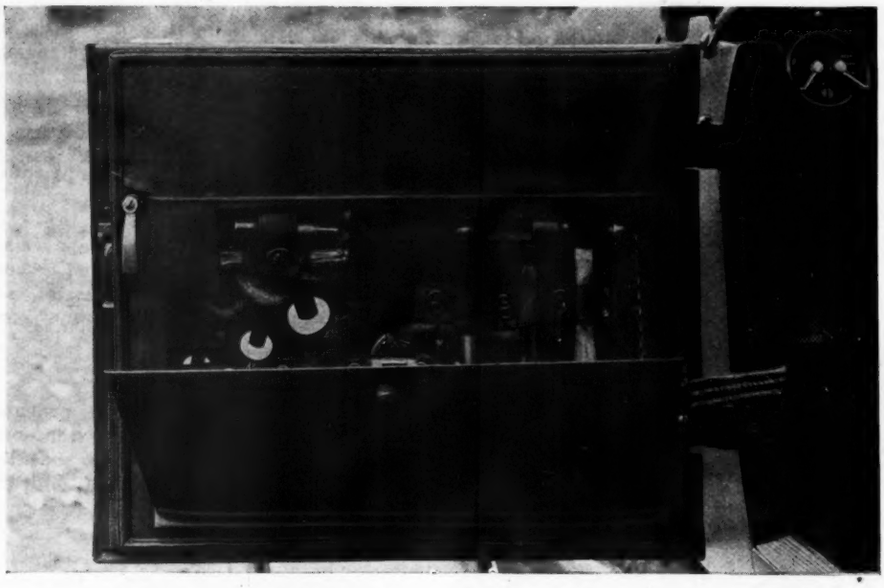
Many of the makers now are putting on adjustablje spring shackles so that wear easily can be taken up. This is especially desirable in cars using Hotchkiss drive, where a great deal of stress and wear is put on the shackles of the rear spring at its rear end and on the spring bolt attaching the front of the rear spring to the bracket on the frame.

With the Hotchkiss drive the rear spring supports have not only to take much of the weight of the car, but also the driving and braking strains. Hence, the better the design of the shackles and bolts at this point the longer the life of the parts and a more satisfactory car to the owner.



Automatic shackle bolts on the new Jordan which compensate for wear

Among those using adjustable spring shackles are Jordan, Hudson, Cole and Locomobile, the latter, by the way, has used this for some time. The Jordan shackle is shown in an accompanying illustration. This shackle is of the type which automatically takes up the wear. The Hudson shackle is made so that wear can be taken up by a slight turn-



The tools have been placed in a more accessible position on many cars and they are of a better grade than formerly. This shows the tool locker on the Jordan

ing of the nut and locking it with a cotter pin.

In the Jordan construction the shackle bolts are put under considerable spring pressure by virtue of the heavy coil springs, on the end of the bolts. The makers have had cars out which have covered some 50,000 miles and it is stated no rattle was in evidence at this point. This device was first used on the front end of the rear spring, but proved out so succesfully that it was added for the rear shackles also.

The assembly at the rear spring front bracket differs somewhat from the rear shackle assembly, although it is identical in principle. One feature is that the coil springs are inter-changeable and are ground to a flat surface for good contact.

Spring Shackle Rattles

Much rattling of the hood and fenders is due to spring shackle wear. In some makes of cars it has become noticeable that spring shackle rattles occur after the first three or four thousand miles of use and there is no way of taking up this play excepting by replacing the parts or bushing the shackles. With the self-lubricating bushings employed in the spring shackles by some makers, some adjustable or compensating device for maintaining tightness is a valuable addition.

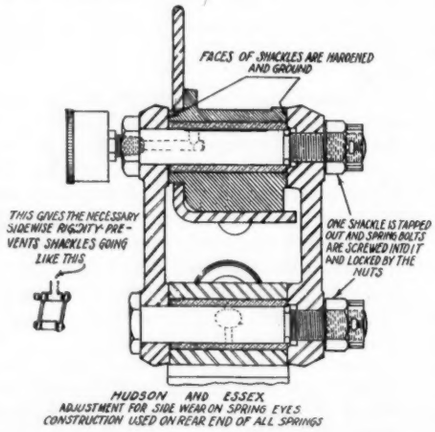
Door mountings and catches frequently have given trouble, in that the doors would not line up properly and the screws attaching the hinges becoming loose. Very often this was augmented by the fact that the car frame was so light that the doors could not be opened when the car rested in certain positions, the resulting binding of the doors causing undue stress on the hinges and locks.

On most of the bodies for the 1922 cars the doors are fitted with alignment devices, so that when they are closed there is every assurance that they cannot get out of line with respect to the rest of the body structure. These alignment devices usually consist of a sort of mortise and tenon joint, wherein the mortise or recess is cut into the door and a small steel plate or tenon attached to the body. The door cannot be closed until these two line up.

Body Hardware

More attention has been given to the selection of body hardware for such items as hinges and catches. Many makers now are fitting longer hinges and attaching these by longer screws. The advantage here is that when a short wood screw is driven into wood like ash, such a screw will, when subjected to stresses soon cut away the threads formed by it in the wood, with the result that it pulls out, or becomes loose.

Longer screws afford a greater bearing in the wood and most of the objections on the short screws are removed. Door catches are a little heavier and machined better. Some makers go so far as to case harden the door latches. Franklin is a good example of this.


FACES OF SHACKLES ARE HARDENED AND GROUND
THIS GIVES THE NECESSARY SIDEWISE RIGIDITY-PREVENTS SHACKLES GOING LIKE THIS
ONE SHACKLE IS TAPPED OUT AND SPRING BOLTS ARE SCREWED INTO IT AND LOCKED BY THE NUTS
HUDSON AND ESSEX
ADJUSTMENT FOR SIDE WEAR ON SPRING EYES
CONSTRUCTION USED ON REAR END OF ALL SPRINGS

The adjustable shackle bolts used on the new Hudson and Essex

There has been some tendency lately to eliminate the metallic ring to doors when they are closed. This often is done by making the door frame heavier and making sure that there is no space between the metal covering on the door and frame.

Much Rattling in Front of Car

Much of the rattling set up in the front end of a car in the vicinity of radiator, lamps and fenders, has been eliminated in a number of designs by a cross rod which ties the two lamps together. This is particularly true when the fender supports, either those of pressed steel or malleable castings have been made heavy enough and substantially attached to the frame. Those makers who do not tie the lamps together with a cross rod are in some cases using slightly heavier gage metal in the fenders and therefore, claim to get just as much rigidity as though the right and left fenders were connected.

An instance of where attention has been given to eliminate rattles is further exemplified in the new Jordan muffler. The muffler now is a two compartment affair instead of a single compartment. The tail pipe has been extended to the rear of the body so as to prevent any chance of exhaust impulses giving a drumming sound, particularly in closed bodies. On the Jordan also the dashboard which separates the engine compartment from the body is backed with a non-sonorous material to destroy resonance.

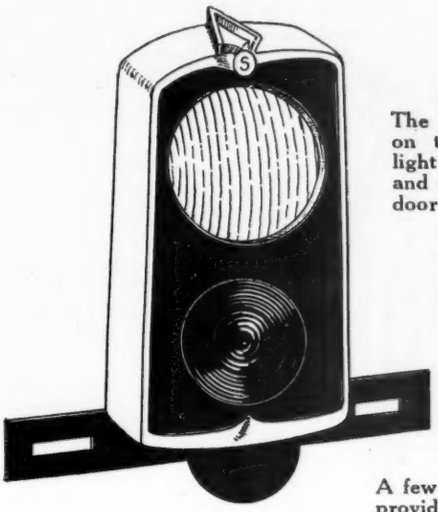
While apparently a detail, mention might well be made here of the attention given to hood catches. If these catches are not well made or located on the hood sills the hood is allowed to move much of the time and sets up a series of vibrations and rattles. There is some tendency for makers to go to the ratchet type of hood fastener, because this type is not dependent upon a coil spring and therefore offers a more positive means for keeping the hood securely in place.

Windshields More Securely Mounted

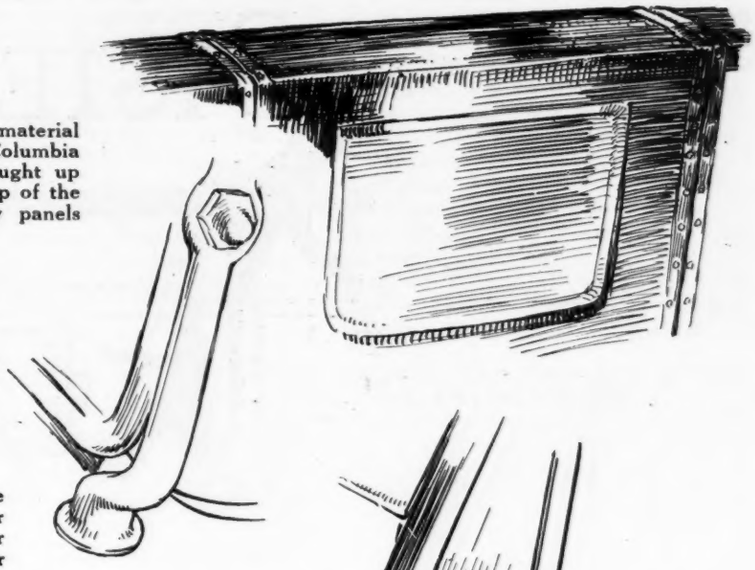
Windshields are mounted more securely. In several instances the windshield stanchions extend through the shroud and are anchored at a point near the bottom of the body. This makes a very long bearing surface and such a windshield is bound to remain securely fastened. Mention also might be made here of the fact that radiators are better supported. In some cases the radiator is being mounted on springs to prevent rattles and, of course, to relieve the core from strains.

Brake rods, the old bugbear or rattles, too, have come in for a great amount of attention. In nearly every case makers are fitting coil tension springs to take up the play in the rods. Also with better laying out of the brake operating levers there is less action on these parts due to spring flexure and naturally less chance for wear and resultant rattle to develop.

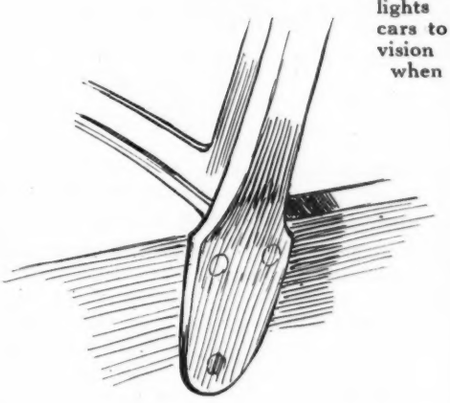
Some Details of Construction Picked Up at the Chicago Show

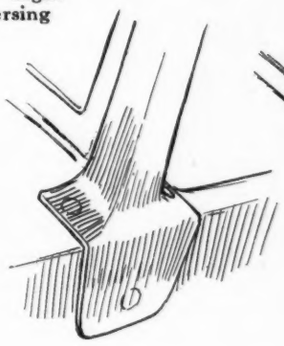


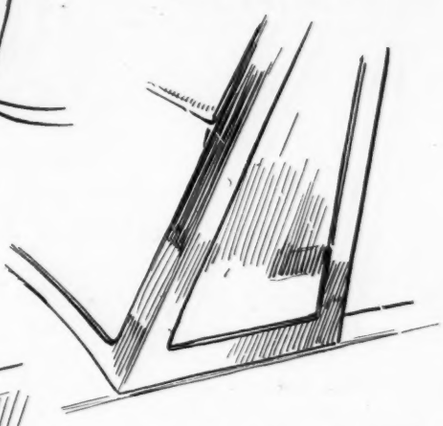
The upholstery material on the new Columbia light six is brought up and over the top of the door and body panels



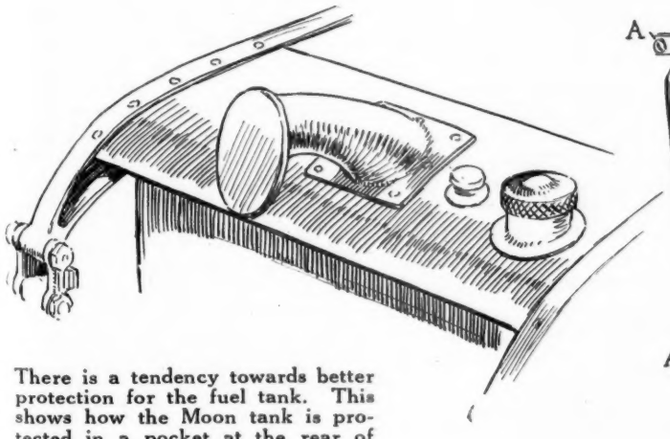
A few makers are providing rear lights on their cars to get better vision at night when reversing



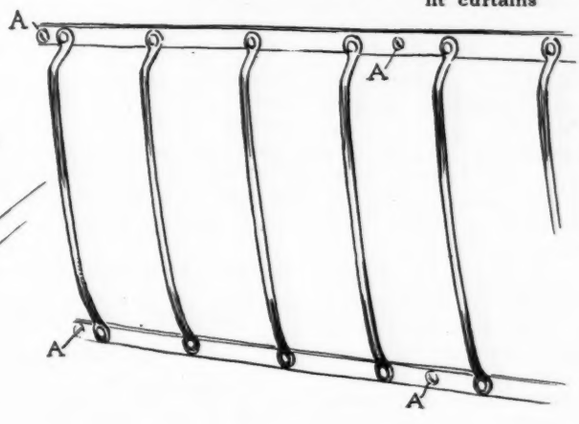


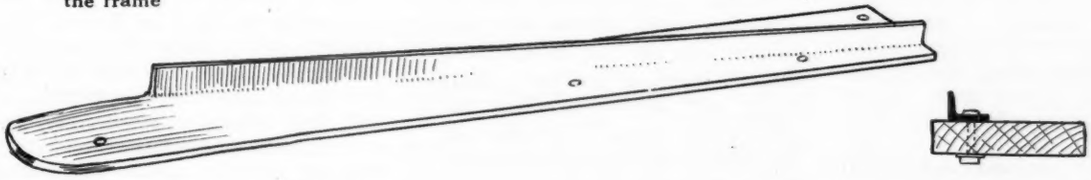


Several makers now are fastening the windshield supports to the body in the manner shown here. This makes for better production and also is better from a construction standpoint. Where the side shields are fitted, it is an easy matter to fit curtains



There is a tendency towards better protection for the fuel tank. This shows how the Moon tank is protected in a pocket at the rear of the frame

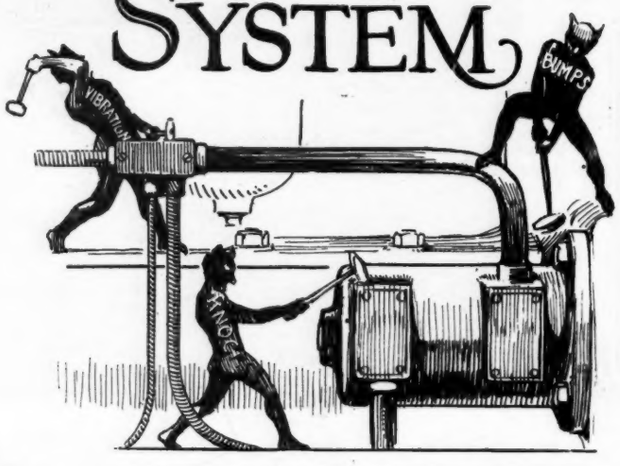




Old time constructions of hood sills have given way on many makes to the aluminum cast sill as shown. Right, old style construction

Instead of fitting each trunk guard rail separately, one maker at the salon mounts them on horizontal metal strips which are fitted to the body by a few screws

FOOLPROOFING THE ELECTRIC SYSTEM



PRESENT Tendency Seems for Mounting Electric Units Separately. Better Wiring Methods in Evidence. Distributers More Accessible.

WHEN Eve first tried on her fig leaf party gown she no doubt had some misgivings as to its utility, being much more complicated than what she was accustomed to wear. When the steam engine was being developed it was commonly conceded to be the work of the devil, and a very dangerous contraption. The first telephone was regarded with awe and doubt, yet in spite of its mistakes and annoyances, who would wish to be without it?

In similar fashion, the first electric starting and lighting system had to stem the tide of custom and prejudice, but like its predecessors it has won its way to popularity by rapid advancement from the first complicated and crude systems, to the present simple and practical applications.

Improvement will never cease as long as the buyer continues to demand the best that can be made, and as long as engineers continue to use their ingenuity but the cars of the present have overcome many of the troubles of recent years, so that the car buyer of today can use the electrical system on his car with hardly any more thought of its construction than he gives to the details of telephone construction when making a call.

Accessibility and What it Means.

To the old school engineer, the only problem that assumed much importance, was factory production, and with an engine mounted on a stand where it could be turned in any position, it did not make much difference where the starter or generator might be mounted.

When in the course of time, however, it became necessary for the owner to have a garage or service station remove the generator or starter, to replace worn parts, he was invariably angry and disgusted to find that one-third of the bill was for fixing the unit and two-thirds for the work of removing and replacing, due to inaccessibility and lack of foresight on the part of the designing engineers.

That the customer is the boss is now being recognized and engineers and service managers are getting closer together, the troubles reported by the service department being carefully studied by the engineering department in working out improvements in new models. This is as it should be, and the car of today is a practical machine both mechanically and electrically, designed to deserve the good will of both the owner and repair man.

Arrangement of Generator, Ignition and Starting Motor.

The first electrical systems favored the combination of the starting motor, the generator and the ignition unit, this arrangement being fine for the manufacturer as but one unit had to be installed on the engine. From the customer's standpoint however it was not so good, for the operation of the car, requiring the sparks from the ignition unit, was interferred with whenever anything went wrong with either the generator or starter. While the motor generator was off of the car, it was impossible to run the engine, for the ignition mounting was in the unit being repaired.

Another arrangement sometimes used is the combination of ignition unit with the generator, the starter being separate. This has the advantage that trouble in the starter which requires its removal does not necessarily affect the operation of the car, as the engine can be cranked by hand, but it still has the disadvantage that trouble in the generator not only requires removal of the ignition, thereby preventing operation of the car, but the removal and replacement usually takes longer due to the necessity of retiming the ignition when it is replaced.

A third arrangement and one which is quite popular is the use of separate ignition but with the starter and generator combined as one machine. Here trouble in the generator or starter has no bearing on the action of the ignition.

The fourth arrangement and one which

Cutting Down the Cost of Service

THE time required to get at a job often makes the cost run into considerable money. This has been true in the past of the jobs on the electric systems of many of our cars. That there will be a wholesale improvement along this line on the 1922 cars is certain because of the attention which has been paid to making the units more accessible and also the wiring.

seems to be the most popular is the use of entirely separate units for ignition, generator and starter. The Paige Motor shown in Fig. 1 is a good example of this design, and it will be seen that work on any unit or the removal of it does not affect any of the other. This tendency to use separate units is also seen in the new Maxwell Models where the 6-12 volt motor generator has been displaced with 6 volt generator and starter.

Motor Generators

While the use of entirely separate units is becoming quite common, there are still many adherents of the motor generator systems, but these have been simplified by the use of one voltage, the complications of the two voltage wiring systems being now practically a thing of the past.

The Dodge car is a good example, illustrating the use of the motor generator, a 12 volt battery being used. The use of this voltage makes possible a fixed sprocket ratio in both starting and generating so that no shifting of gears is required and the chain drive employed gives very silent operation.

The use of chain drive usually means that while the generator is being repaired, that the car cannot be run, for the chain would be wound up in the sprocket on the crank shaft. On the other hand the removal of the chain would require the removal of the front of the crank case and the advantage of being able to run while the generator was being repaired would not be worth the cost of removing the chain.

On the Dodge car however, it is a fairly simple job to remove the chain, and it is not difficult to replace it, due to the large inspection cover provided over the upper sprocket. The detail instructions for such a job were given in the Dec. 1, 1921, issue of MOTOR AGE, page 22, where the Electrical System on the Dodge Car was carefully analyzed.

On eight cylinder cars the use of a motor generator is also quite common, due perhaps to limitation of space with the Vee type motor. Here it is common practice to mount the ignition unit between the two cylinder blocks at the front and have a motor generator also between the two cylinder blocks, but at the rear. A six volt battery is usually used, with a gear reduction between the starting motor and the flywheel, the operation as a generator being a more nearly one to one ratio, often by a shaft extending forward and driven by the same belt that operates the fan.

Starting Motors

Where the starting motor is a special unit entirely apart from the generator and ignition, the accessibility is usually very good, although some cars have undesirable features in connection with the removal or replacement of the starter.

For example on one car the bolts that attach the starting motor to the crankcase, come through from the inside so that when the motor is removed, they are likely to fall into the crank case. On some other cars the starter is in such close proximity to the frame, steering column or other parts of the car, that it is necessary to remove part of the engine pan and lower the starter to get it off.

On another car certain screws that must be removed to take the starter off are in such a position that other parts of the car interfere with the use of a screw driver, and make special tools almost essential for what should be a simple job.

Fortunately the application of the starting motor on most cars is such that no such difficulties are encountered. On the Lexington for example it is only necessary to remove three rather accessible cap screws in the flange of the starter in order to get it off, while in the Mitchell shown in Fig. 2 the starter is held by clamp bands, the attaching screws are neither behind or under some other part, so that no mechanical gymnastics are required.

Another type of starter installation is even more simple, being well illustrated in the Packard Motor in Fig. 3. The Bendix type of drive to the flywheel is used, and the end bracket casting at the drive end is turned so as to be an easy sliding fit in the hole machined in the flywheel housing. The one bolt or special screw shown at the top of the flywheel housing, just at the right of the starter, extends down and fits in a hole in the extended portion of the end bracket. This is sufficient to keep the starter from either turning or sliding out, and the ease with which the starter can be removed or replaced needs no further emphasis.

Generator Installations

Very few generator installations are now in evidence where the removal of the generator interferes with the rest of the car. One such application was the use of a chain drive which made it dangerous to even turn the engine over while the generator was off, on account of the possibility of the chain getting out of place on the crank shaft sprocket, and jamming between the sprocket and the crank case, while running the engine was obviously out of the question.

Another installation which interferes with running the engine with the generator off is the system by which the drive for magneto or pump is transmitted through the armature shaft, so that with the generator removed, either the water pump or the magneto as the case might be would be inoperative.

Engineers who have laid out such systems do not appreciate that at some times, when a generator must be repaired, that the customer may not be located in a large city where a large stock of parts is available, and that days and sometimes weeks elapse before the proper parts can be secured. If under such circumstances the car can not be run while the parts are being obtained, the customers opinion of that make of car can be better imagined than printed, but if on the other hand the engineer's foresight had made it possible to run without a generator, by getting the bat-

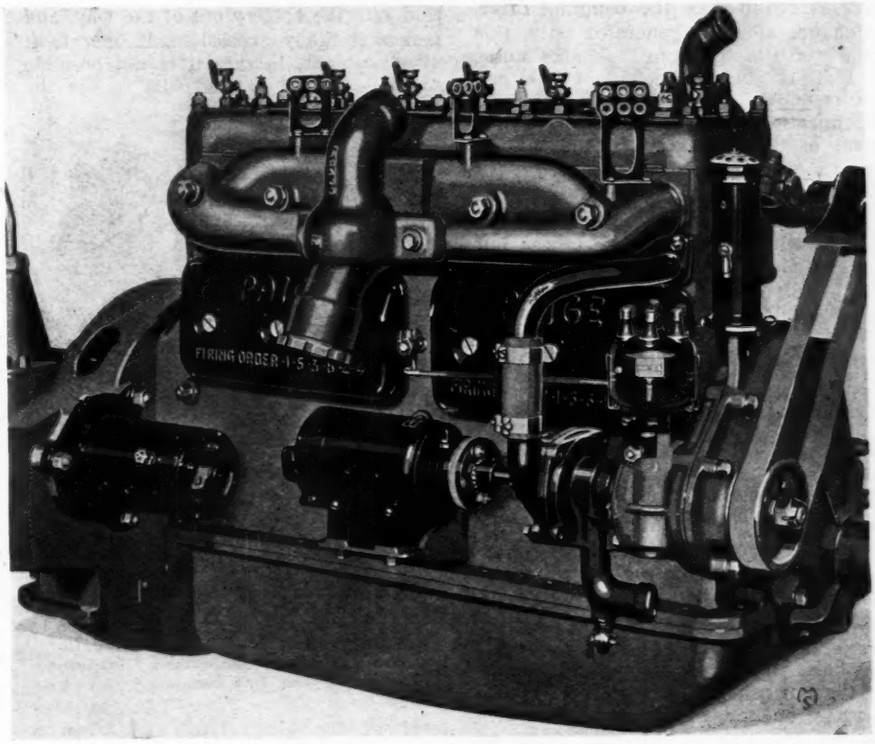


Fig. 1—Here is shown the layout of the electric units on the Paige engine. Note how the coil is located to prevent excessive heat. Ignition timing is not disturbed by removal of generator

tery charged occassionally, the customer's attitude in regard to that car would be quite different, and tend to reduce instead of increase the sales resistance in that particular territory.

Conditions as above described are overcome in the gear driven generator where the unit itself can be removed and the car run without the generator. This usually requires, however, a plate of some sort to cover up the opening left where the generator came off, and in the Ford car such a plate is a standard part, available at any Ford Service Station. Even where such a part is not regularly supplied it would be no great task to cut a piece of cardboard to such a shape that it could be used temporarily to stop up the opening.

Another installation where even less work is required is the coupling drive, which operates the generator only, this being well illustrated in the Paige Motor in Fig. 1 where removal of the cap screws under the generator bracket and disconnecting at the coupling permits removal of the generator, without affecting any other part of the motor.

Another construction which permits of easy removal of the generator is shown in the Nash Motor Fig. 4 where the fan is mounted on the generator shaft and both are driven by a V belt. This type of drive although not very satisfactory with an ordinary flat belt is becoming more popular with the use of the V belt which holds much better, giving quiet operation and reducing slipping to a minimum.

The generator is held in place by two large cap screws, one on each side, one of these showing in the cut, and to adjust the belt it is only necessary to loosen these screws and slide the generator up, then tighten the screws again, Also for removing the generator it is only necessary to take out these two cap screws, and remove generator and fan together. Of course without the generator the fan can not be used, but in cold weather or for short runs in warm weather the use of the car would be possible.

Battery Location.

The use of a separate battery box on the running board of the car is practically a thing of the past, the main objection being the appearance, when the trend of the times has been in the direction of trim lines, and the elimination of extras which have the appearance of having been stuck on as an afterthought.

Instead of the battery box, provision is now made in the construction of the car itself, some locations being such that the battery is nearly as accessible as it was in the old type running board box, while other locations do not give the same accessibility.

The need of accessibility in battery locations is the well known fact that water must be added to each cell occasionally to replace that which is lost due to evaporation. This evaporation of the water out of the electroylte or sulphuric acid is produced to a great extent by heat, so that in hot weather water should be added at more frequent intervals than in cold weather.

The heat from the engine, depending on the battery's location will also increase the rate of evaporation, while a certain amount of heat is produced inside the battery itself all of the time that the generator is sending charging currest to the battery.

Now human nature being such that those things hard to do are left undone, it is obviously up to the car designer to make the job of adding water sufficiently easy that the average man will not fail in this important detail.

One location often used is in the running board shield, a special compartment being built into the shield, with a cover easily removed. While this location gets the battery out of the way, and makes it fairly accessible, it has slight disadvantages, in that it is not possible to look down into the cells to see the

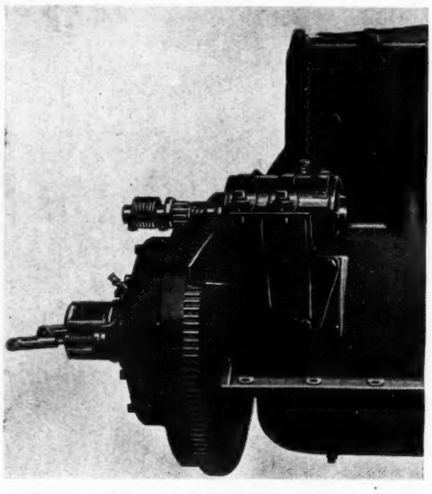


Fig. 2—On the Mitchell engine the starting motor is very accessibly located and easily removed by loosening two bands

level of the electrolyte, and when a hydrometer is used, it is necessary to hold it at an angle so that the float rubs against the sides of the tube and a reading is hard to get. Also in this location the terminal screws that hold the terminals to the battery posts are hard to get at with pliers or wrench when it becomes necessary to remove the battery.

Another location that is often used is under the rear floor, where the accessibility is fair if it is not too hard to get the floor board up. Here the level of the liquid can be easily seen and there is no great difficulty encountered in working on the terminals. In this location the battery is however often near the exhaust pipe, the heat from which no doubt increases the frequency with which water must be added. Mud and water splashing onto the battery also reduces the desirability of this location.

The space under the front floor is also often used, its advantages being about the same as for the location under the rear floor, while the disadvantage of heat from the exhaust pipe may be a little greater, being nearer the engine, this being especially true if the exhaust pipe curves arousd the battery box as shown in Fig. 5.

Another location that seems to have more advantages than any of the others is under the front seat, where it is only necessary to lift the cushion to get at it. Here the accessibility is good and at the same time the battery is not exposed to splash of mud and water and is usually high enough to get away from the heat of the exhaust.

High Tension Wiring and Distributer Location, Also Coil Location

The arrangement of the high tension wiring does not have a great deal to do with the running of the car although long high tension wires are not desirable on account of the static or high tension condenser effect, which slightly reduces the heat value of the sparks.

From the standpoint of appearance however and coil accessibility, there are some arrangements that are better than others, some cars for example having the ignition coil located under the cowl at the upper part of the toe board where it is not only hard to get at but requires long high tension connections.

The ideal distributer location seems to have been attained in the Packard Single Six shown in Fig. 3, also in the Rickenbacker Motor shown in Fig. 6. In this arrangement, the motor is built with a vertical shaft driven from the cam shaft, with the oil pump at its lower end and the distributor at the upper end. This makes possible the use of very short wires, which is not only best from a theoretical standpoint but eliminates much chance of the spark current leaking away due to the insulation being rubbed, as is sometimes the case where long wires are used.

Another car with a good layout of high tension wiring is the Nash shown in Fig. 4, the side location of the plugs making the side location of the distributor best for this motor.

Ventilation of Distributer

In the design of high tension wiring and distributers there has been some attempt to completely cover the distributer, with the idea of protecting it from dirt and moisture. The idea of keeping moisture away is a good one, as water is a conductor for current at high voltage, a wet spark plug for example, firing over the surface of the insulator instead of inside the cylinder.

With the material now used in distributer caps, however, the water does not collect to any appreciable extent as a film over the surface, but forms in small drops and rolls off as from an oiled surface, so that it is not easy to get a continuous conducting path to ground due to rain. Should the surface of the distributer cap be allowed to become coated with a layer of oil and dust however, the water will collect in this

layer of dirt and form a continuous leakage path for the high tension current which may kill the ignition.

In trying to protect the distributer with a tight cover the dirt is no doubt eliminated to a great extent but another trouble may be experienced, that warm air from the engine may work up the distributer shaft to the interior of the distributer cap, then in cold weather when the cold blast from the fan strikes the outside of the distributer cap, the cooling action condenses the vapor inside, causing it to settle on the interior surface of the cap, and shorting out the high tension circuits.

It would therefore seem as if ventilation of the distributer cap rather than tightly enclosing it was the preferred alternative, as with a well designed cap with plenty of surface between the high tension terminals and ground, there is no danger of trouble if the cap is wiped off occasionally.

Distributers are made in two general types, one in which a brush makes a rubbing contact with a track in which the contacts are molded, the other having no track, and being known as a gap type distributer.

In this type the brush is merely a piece of metal to which the high tension current is carried by a wire leading to the center of the cap, and at the time the spark occurs this piece of metal is opposite and within about .010" of one of the inserts in the side of the cap. The high voltage is able to jump this small gap in addition to the one in the cylinder. This type of distributer is very satisfactory, but when the small spark occurs inside the cap, the effect is to produce chemical decomposition of the air, which causes rapid corrosion of the metal parts inside of the cap, unless there are some openings to allow a certain amount of ventilation.

It is easy to see that in this type of distributer a protecting cover would do more harm than good while even in the other type its value is somewhat questionable.

Other Ignition Features

Not so very long ago, when it became necessary to retime the ignition it was necessary to remove the front end of the crank case and change the timing by the relation of the timing gears to each other, there being no other adjustment.

Adjustable couplings have eliminated this unnecessary work in the case of magneto installations and with battery ignition, the use of adjustable cams has made the timing of the ignition a comparitively simple job. Most of the ignition systems on the market use this method; another scheme which accomplishes the same results however is the use of an arm on the ignition head, which is adjustable with respect to the ignition unit and can be tightened in any position. This makes it possible at any time to loosen the clamping screw, turn the ignition head to get the desired timing and then tighten the screw again.

Another feature of modern battery ignition systems which is quite an improvement over previous development is the use of a metal plate on which the interrupter mechanism is mounted, this plate being located in the interrupter casting in such a way that it can be rotated by the spark advance arm to give the necessary change in timing for different engine speeds.

The chief value of this design is elimination of the movement of the whole ignition unit, which requires a certain amount of twisting in the high tension wiring, which in time may cause chafing of the insulation or cause the wires to come loose from the cap.

Condenser Location

What would be thought of a car maker who would use a wheel with a tire built in as part of the wheel, so that every time the tire was damaged it would be necessary to buy a whole new wheel? Now no engineer in his right senses would consider a design of that kind, yet there are many ignition coils made in which the condenser is included, and in which it is impractical to change the condenser. Now this means a shorted condenser which should cost the customer about a dollar or so costs him more like ten dollars because he has to buy a whole new coil, when the actual winding had nothing the matter with it.

Now the old short-sighted idea of selling the car at any old price and hooking the customer on the parts later on is giving way to the idea that if the automobile business is to continue to prosper it will be due to the good will of the public. This means that the waste of good material and the unnecessarily high cost of service must soon be a thing of the past, if the industry is to have a substantial basis for its existence.

In the case of the condenser location it means that separate mounting, with replacement a matter of minutes and pennies instead of hours and dollars, is the design that will win. The idea is carried out in the Wagner condenser shown on the Nash Motor in Fig. 4 at the base of the distributor, it being the circular object about the size of a watch which is shown fastened with two screws and with one wire coming up to the interrupter terminal.

The Delco Ignition on the Packard Motor in Fig. 3 also has the replaceable condenser, it being the rectangular object at the left of the distributor which is shown at the top of the motor.

External location of the condenser is not essential for easy replacement as some condensers mounted inside of the interrupter housing are also easily replaced, while new type coils are making their appearance, in which the interior is not poured full of compound as has been the custom, and with removable end pieces, it is about as easy to replace the condenser as with the other locations previously described.

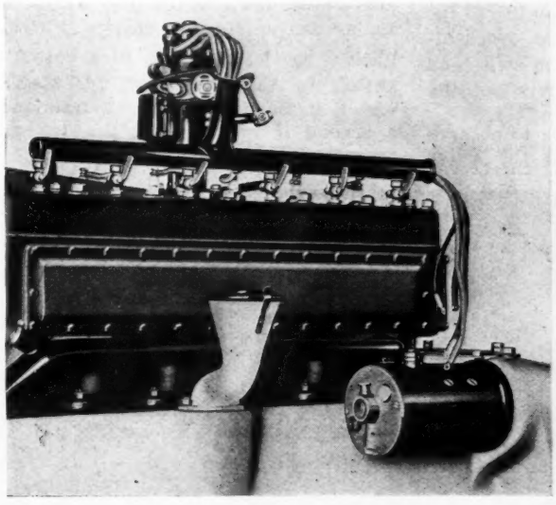


Fig. 3—On the Packard the removal of one bolt allows the starting motor to come off

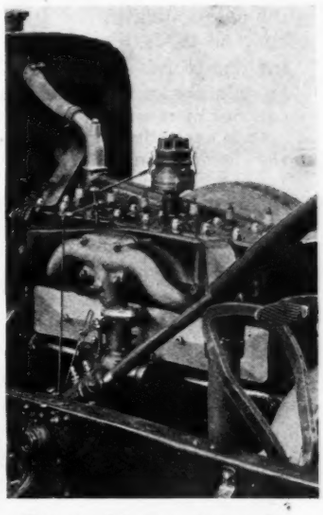


Fig. 6—Here is shown the accessible location of the distributer on the Rickenbacker

Ignition Reliability

While both battery and magneto ignition have been developed to the point where they are very reliable, you will still find ignition parts in the stock room, just as you will find springs and other mechanical parts.

From the customer's standpoint however, there is quite a difference between breaking a spring which he can see and breaking down the coil insulation which he CAN NOT SEE, especially if he happens to be miles from civilization. In the one case he can probably patch things up with a board or two in order to reach the next town, but if the coil goes bad he is usually stuck.

Now as previously stated such things are of rare occurrence but it is interesting to see designs coming to the front in which two coils are used, this being the scheme used on the Wills Sainte Claire eight, where if anything happens to one coil the engine will still run on four cylinders, which, while not ideal, is much better than not running at all..

This is accomplished by the use of a four point cam with two sets of interrupter points and two coils.

Coil Location

This is not very material except as it affects the length of high tension wiring or puts the coil in such a place that it is either kept cool or else is subject to the engine heat, as overheating is as detrimental to a coil as to a battery. The effect of heating the coil is to melt the wax which is usually used as insulation around the windings and in conjunction with layers of paper in between the layers of wire.

When this insulating material becomes hot it seems to lose its ability to resist the flow of current and the energy of the coil which should send a spark to the plug is wasted by leakage through the layers of the winding. This may weaken the spark slightly, shorten the life of the coil, or in extreme cases, as overheating due to leaving the ignition switch on by mistake, might immediately put the coil out of commission.

It is accordingly interesting to observe the location of the coil on the Paige Motor in Fig. 1, it being right up in front where it avoids most of the engine heat. Here it is of course subject to water entering through the radiator, but as with the distributor it will be found that the water does not form a continuous film and therefore does no harm unless the coil is allowed to get badly covered with a layer of oil and dirt.

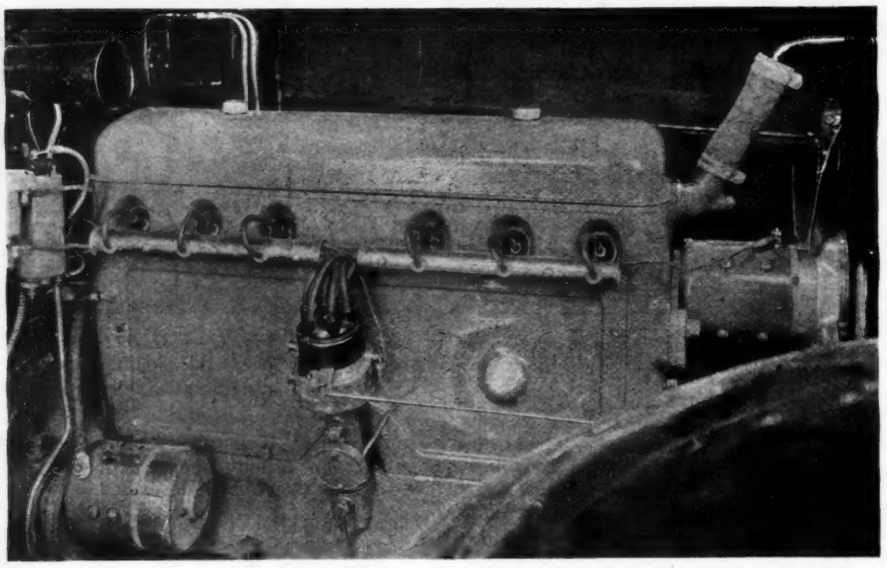


Fig. 4—A good example of distributer location and high tension wiring. This is on the Nash Six. The generator comes off by removal of two cap screws

Developments in Lighting

Much has been said about glaring head lights, correct illumination of the road, etc, but the net result seems to have been nearly limited to experiments with different sorts of lenses, the value of which is often rather questionable. Also when it is considered that all that can be seen of an approaching car is a pair of head lights, while the point to be avoided is the other fellow's hub cap, it is easily seen that there is much room for improvement.

This problem has been well handled on the Wills Sainte Claire car in two ways, first by having an electro magnetic means for tilting the head light reflectors down on approaching another car, and secondly by providing a light at the side of the car which being operated at the same time the bright lights are turned on, serves to throw light on the left running board so that the driver of the approaching car can see exactly the part of the car that he has to clear. This side light called a "Courtesy Light" also facilitates entering and leaving the car at night due to the illumination of the running board.

The tilting of the bright light reflectors means that the rays of light instead of striking the approaching car are thrown down on the road where they are needed, and as this change is accomplished by the operation of a button or switch in the center of the steering wheel, it means that only a fraction of a second is required for the driver to operate the reflectors.

To give an idea of the method in which this is accomplished a simplified wiring diagram has been shown in Fig. 7, most of the detail of the actual wiring being omitted. In this sketch it will be seen that operating the lighting switch will send current from the battery to either the large bulbs in the main part of the head lamps or to the small bulbs in the lower part of the head lamps.

With the switch in the up or bright position it will be seen that the battery connection is also carried to the windings in the head lamp which operate the reflectors, but as the other ends of the windings are not connected to ground, no current flows and there is no action. On approaching another car however, the operation of the Reflector Tilting Button serves to complete the circuit of the electro magnets to ground, thus energizing these electro magnets and tilting the reflectors.

From the diagram it will be seen that operation of the Tilting Button would have no effect with the Lighting Switch in the Dim position as the circuit of the bright lights is dead at that time.

In addition to the two lighting innovations just described, the Wills Sainte Claire car has a novel arrangement of rear lights, there being two, side by side, one the conventional tail lamp with red glass and the other with a plain glass and large bulb for use in backing up on a dark roadway. The tail lamp is operated in the regular way by the regular lighting switch but the backing light is operated when the gear shift lever is put in the reverse pasition.

Work Light Under Hood

Those who have tried to change a spark plug at night are aware of the fact that while the spot light may hit the radiator it does not throw much light on the engine. To make it easy to do small jobs on the engine at night the designers of the Lexington have provided a small light under the hood in the center of the dash, which, operated by a small switch in the base of the light itself, should prove quite a convenience.

Wiring Improvements.

Car manufacturers are rapidly waking up to the fact that wiring a car does not merely mean putting on connections that will make things work until the car is sold, but that the arrangement must be such that for years to come, inspection and repairs will be facilitated due to the original layout.

One serious trouble that electricians have had to contend with is the limited length of wire allowed on the back of the cowl board, which means that when a lighting switch or ammeter has to be removed or replaced, that it is necessary to stand on one's right ear on top of the gear shift lever housing and disconnect all wires on the back of the instrument board before the instrument in question can be pulled out.

This trouble has been overcome in many cars by merely leaving the wires long enough so that the instrument can be first pulled loose from the cowl board, and after it is out where it is easy to work on, the wires can be disconnected. When this is done the switch is usually up side down so that marks on the switch which tell where to reconnect the wires are hard to read.

Studebaker Has Improvement

This condition has been taken care of on Studebaker cars by putting the terminal marks up side down so that when the electrician comes to work on the car they will be right side up as far as he is concerned.

In Oldsmobile cars the ammeter and Lighting and Ignition switch are mounted in a small door in the cowl board which is hinged at the lower edge so that it can be opened at will in order to inspect the terminals and wiring.

This same scheme is used on the King eight with a slight improvement, in that a lock is added to the door and the space in which the instruments are located is enclosed so that no one can tamper with the wiring or connections.

Grounded Wiring System Prevalent

In the first electrical systems used on motor cars it was customary to use two wires in each circuit, carrying current to and from the various units, but with the trend to simplification, the use of the frame as a return circuit has become more common. Using the frame as a ground or return circuit met with some opposition from those who thought it might be more easy for shorts to develop in such a system, but with careful wiring this is not the case, the opposite being more nearly true, for in the two-wire system there is great likelihood of trouble where the two wires go into the head lamp plug, as the terminals into which they fasten are not much over one-eighth inch apart and it is very easy for a stray strand of wire to short from one plug terminal to the other.

Improved methods of installing the wiring also do much to eliminate trouble, the use of armour-covered wire doing much toward rendering shorts unlikely, while the use of conduit and junction boxes is even better. The Locomobile, which has used conduit for many years, is a good example of a good wiring job, trouble of this sort being a very rare occurrence.

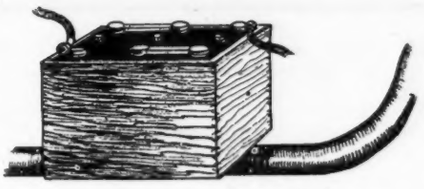


Fig. 5—Running the exhaust pipe too close to battery is poor policy

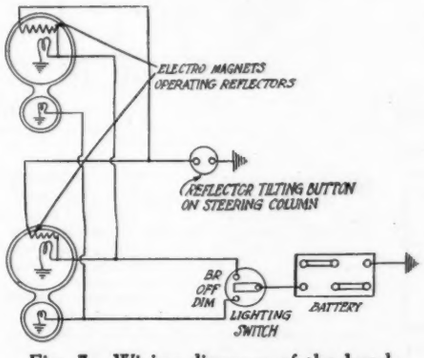


Fig. 7—Wiring diagram of the headlight tilting device on the Wills Sainte Claire

Why So Much Secrecy About the Electrical System?

This query does not apply to all car makers, but there are still some who, when approached about some detail of the electrical system, take the attitude that the construction of their particular apparatus is a very wonderful secret which must be kept at all hazards, while the facts are that while the details of construction may vary from those in some other make, that the apparatus is based on the same electrical principles used in all other electrical systems.

It would be far better if all the information possible were scattered broadcast to every garage and repair shop, so that when the customers who have that particular type of car get into trouble there would not be a mechanic in the country who would not know just where to put his finger to find and correct the condition.

For example, let us suppose that a man driving a Complex six drives into a garage and complains that his ammeter always shows discharge. The electrician at the garage may know the theory of car wiring in general and be able to fix any of them if given the time, but how can he know the details of the wiring on a thousand different cars?

Why Not Supply a Permanent Diagram With the Car?

Suppose the electrician just referred to could lift the hood and on the front of the dash find a metal plate with the wiring diagram engraved or stamped into its surface, and from his general knowledge and the specific information that this would give him, go and immediately put his finger on the cause of the trouble. Would this not give the customer the quick service and freedom from trouble to which he is entitled?

Manufacturers Will Aid Theft Prevention

THE first step which the automobile thief usually takes in changing the identity of stolen automobiles is to change the engine numbers so that the automobile engine cannot be identified. Realizing the need for a method of numbering engines which would make it extremely difficult for thieves to change engine numbers, the automobile insurance companies suggested that the Society of Automotive Engineers should devise the method of numbering engines which was approved for general use in 1916.

It was understood that a 7½ per cent reduction in theft insurance premiums would obtain if a method of numbering engines was adopted by the society as standard which would conform with the Underwriters Laboratories requirements.

Method for Numbering Engine

The S. A. E. Engine Division consequently made a careful review of present practice, soliciting suggestions and comments from insurance companies, automobile and engine manufacturers and metallurgists in reference to methods of numbering engines. Several interesting but not feasible methods were submitted. The majority of the replies indicated preference for plain figures about ¼ in. high deeply stamped into a pad or plain surface cast on the engine.

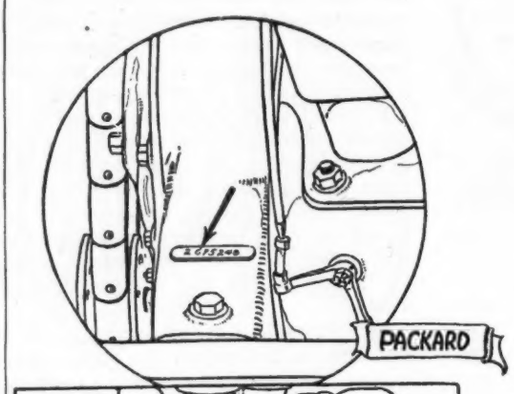
After holding two meetings at which this was the principal subject discussed, the following method of numbering engines is recommended as being the simplest, most effective and practical system for numbering engines which has been devised for protecting automobiles against theft.

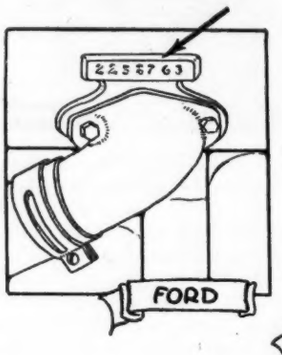
The engine serial or identification number shall be placed near the top of the right-hand side of the crankcase proper in a position in which it can be read easily. It shall be between two vertical ribs or beads ¼ in. wide, ⅛ in. high, 3 in. long and 3 in. apart . The surface of the casting between the ribs shall be left rough as cast and unpainted on the finished engine. The numbers shall be evenly stamped in the casting 1/32 in. deep and shall be ¼ in. high and of script form. The first digit shall be stamped close to the left-hand rib and the last digit shall be followed by a large star or other character to prevent adding digits. A star or other character also shall be stamped immediately above and below each number to prevent adding another number. The numbers shall be stamped twice on each casting, to permit correcting any errors made in stamping either number. No other number or character shall be placed within the space provided.

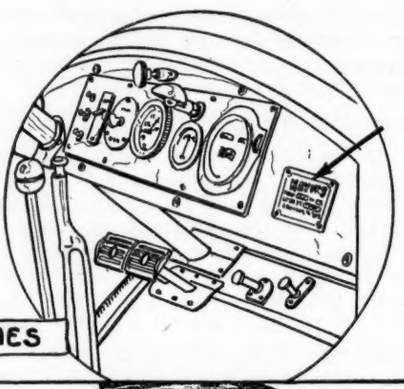
Errors Self-Corrected

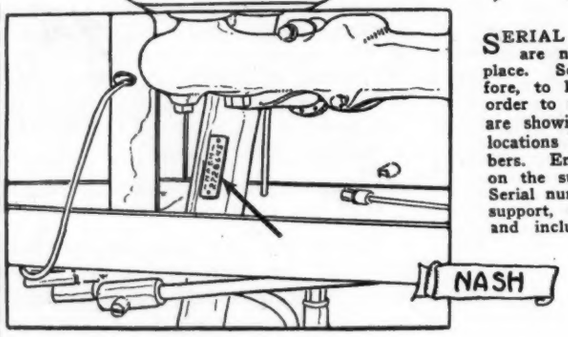
By this method, in case an error is made in stamping either number, an additional number would be stamped directly under or above the number, the number stamped in error being cancelled by stamping a horizontal line through it. In this way two correct unmutilated numbers would appear on each engine. In case errors were made in stamping both the original numbers, the casting would be scrapped as the system requires that at least one of the two original numbers shall be unmutilated in any way.

Among the several suggestions which were received as a means for preventing engine numbers from being changed were casting a pad of special alloy steel in the engine crankcase on which the engine numbers might be stamped, casting numbers of an opaque material in a cylinder block in such a way that X-ray photographs would show the numbers, using raised numbers and casting on a small thin brass plate with edges crimped down ⅛ in. and knurled so as to anchor the edges securely in the crankcase, the number being stamped in the brass plate in the usual way.

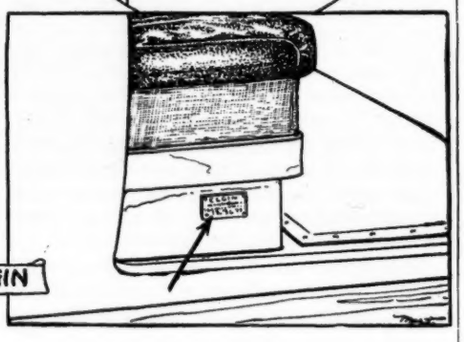








SERIAL numbers and engine numbers are not always located in the same place. Sometimes it is difficult, therefore, to locate the numbers readily. In order to make the job a little easier we are showing herewith some of the usual locations for the serial and engine numbers. Engine numbers often are located on the supporting arms, nameplates, etc. Serial numbers may be on the dash, seat support, etc. Only the numbers up to and including the 1920 cars are listed.



Motor Age Passenger Car Serial Numbers

ACE

Year	Model	Cyls.	Price	Serial Numbers
1920	L	6	$2260	1001 to 1556

ALLEN

Year	Model	Cyls.	Price	Serial Numbers
1914	40	4	$1395	2000-2753
1915	34	4	895	3499-5233
1916	37	4	795	6000-15631
1917	Classic	4	850	
1918	41	4	1095	18000-21000
1919	43	4	1395	
	Number stamped on front motor cross member			
1920	43	4	1495	50001 and up
	Number stamped on frame at right front spring hanger			

AMERICAN

Year	Model	Cyls.	Price	Serial Numbers
1917	A	6	....	1-250
1918	B	6	$1375	251-1000
1919	B	6	1865	1894-2378
1920	B-6	6	1865	
	Number on left side of motor			
	Number on inside of dash under hood, lefthand side			

APPERSON

Year	Model	Cyls.	Price	Serial Numbers
1913	45	4	$1600	4000-5999
	55	4	2000	
1914	45	4	1785	6000-8499
	45-58	6	2200	
1915	40	4	1350	8500-10500
	45	6	1485	
1916	6-16	6	1550	10501-12000
				15000-16000
	8-16	8	1850	12001-13000
1917	6-17	6	1750	16001-17000
	8-17	8	2000	12000-13000
1918	6-18	6	....	17000 up
	8-18	8	2550	
1919	8-19	8	2800	
	Anvsy.	8	4000	18000-21000
1920	8-20	8	2950	
	Anvsy.	8	4000	
	Number on right front engine leg			
	8-20	8	3500	19000-21702
	Anvsy.	8	4250	
	Number on right front side of crankcase			

ARGONNE

Year	Model	Cyls.	Price	Serial Numbers
1919	....	4	$4750	....-110
1920	....	4	4750	2011 up

ANDERSON

Year	Model	Cyls.	Price	Serial Numbers
1914	100-A	6	$1295	
1915	100-A	6	1345	
1916	200-A	6	1435	
1917	300-A	6	1550	
1918	400-A	6	1435	
1919	Series 30	6	1850	
1920	Series 30	6	1850	
1920	30-A	6	1850	371-37272
1920	30-B	6	....	331-3340
1920	30-C	6	....	351-35916
1920	30-D	6	....	341-34325
1920	30-E	6	....	381-3827
1920	30-G	6	....	361-36341
	Number on plate under hood, right side dash			

AUBURN

Year	Model	Cyls.	Price	Serial Numbers
1912	6-50	..	$3000	
	40-N	..	1750	
	Numbers not by years nor in consecutive order			
	40-H	..	1650	
	35-L	..	1400	
	30-L	..	1100	
1913	6-50	6	3000	
	6-45	6	2000	
	40-L	4	1650	
	37-L	4	1400	
	35-L	4	1400	
	33-L	4	1150	
1914	4-40	4	1490	
	4-41	4	1590	
	6-46	6	2100	
	Numbers on side body below front door			
1915	4-36	4	1075	
	6-40	6	1500	
1916	6-38	6	1050	
	6-40A	6	1375	
	4-38	4	985	
1917	6-39	6	1145	
	6-44	6	1535	
1918	6-39-B	6	1345	
	6-44	6	1685	
1919	6-39H & 39K	6	1695	
	Number on floor board in front under cowl			
1920	6-39	6	1795	22100 and up
	Number on end of seat, left side. The serial numbers of this car do not run consecutively or by years			

AUSTIN

Year	Model	Cyls.	Price	Serial Numbers
1914-15	66	6	$4000	1400-6075
1915-16	77	6	6000	FO12-F1045
1916-17	66	6	3600	C1003-C2862
1918	12-Cyl.	12	3750	C1003-C2862
Discontinued	Number on instrument board			

BEGGS

Year	Model	Cyls	Price	Serial Numbers
1918	18-T	6	$1530	1018-1108
1919	19-T	6	1580	1019-11609
1920	20-T	6	1630	1020 and up
	Number on front end of frame; engine number plate on left side of motor			

BIDDLE

Year	Model	Cyls.	Price	Serial Numbers
1915	C	4	$1700	C200-C299
			1700-	
1916	D	4	1850	D300
1917	D	4	2275	D
1918	H	4	2750	H100-H1099
1919	H	4	2985	H1100-H1179
1920	B-1	4	3950	2000 up
	B-5	4	....	1500 up
	Number on dash; engine number on upper left front crankcase			
	B-1	4	3950	2000 up
	Number on right side of dash			

BOUR-DAVIS

Year	Model	Cyls.	Price	Serial Numbers
1916	17	6	$1250	1-267
	Number on dash under hood; engine number on left side crankcase			
1917	17-B	6	1500	1000-1022
	Number on top of seat frame under cushion			
1918	18-B	6	1850	1100-1104
1919	.....	..	....	1105-1134
	Number on dash under hood. No record of 10 or 12 cars built by Shadburn Bros., Anderson Ind.			
	20	6	1595	
1920	.....	..	1700	1 up
			9/1/19	
1920	20	6	1825	1-200
	21	6	2585	2000-2096
	Number on front seat base opposite left hand door; engine number on left side crankcase			
	Number on front seat near floor board			

Motor Age Passenger Car Serial Numbers

BIRCH

Year	Model	Cyls.	Price	Serial Numbers
1920	30-B	4	....	B-126 up
	40	4	....	42000 up
	45-B	6	....	N-151 up

Number on name plate on dash

BRADLEY

Year	Model	Cyls.	Price	Serial Numbers
1920	H	4	....	1400 up

Number under front seat, on dash and on bottom of all doors

BREWSTER

Year	Model	Cyls	Price	Serial Numbers
1915	41	4	....	41001-41242
1916	41	4	....	
1917	41	4	....	
1918	41	4	....	
1919	91	4	....	91242-91241
1920	41	4	9000	41242-41341

Number on plate screwed on the motor side of dash

BROOK

Year	Model	Cyls.	Price	Serial Numbers
1920	S-20	2	$ 395	1-1500

Number on front of timing gear housing

BRISCOE

Year	Model	Cyls.	Price	Serial Numbers
1914-15	B-15	4	....	101-4000
1916	4-38 & 8-38	4	....	5001-8751

Number on front seat heel board

	4-24	4	....	15001-18846
1917	4-24	4	....	18847-26604
1917-18	4-24	4	....	26605-34885
1919	4-24	4	....	34886-45786
1920	4-34	4	$1185	M-550-M-558
				50000-57500

Number on Models B-15, 4-38 and 8-38 on front seat heel board; model 4-24 on dash
Number on dash plate

BUICK

Year	Model	Cyls.	Price	Serial Numbers
1912	34-35	4	$ 900	
			1000	
	36	4	900	
	28-29	4	1025	
			1180	
	43	4	1725	
1913	24-25	4	950	
			1050	
	30-31	4	1125	
			1285	
	40	4	1650	

Number on rear cross frame member; engine number on left side of crankcase

1914	B-24-25	4	950	
			1050	
	B-36-37	4	1235	
			1335	
	B-55	6	1985	
1915	C-25-24	4	900	100000-144715
			950	
	C-36-37	4	1185	
			1235	
	C-54-55	6	1635	
			1650	
1916	D-44-45	6	985	
			1020	144717-254501
	D-54-55	6	1450	
			1485	
1917	D-44-45-46	6	1040	
			1070	
			1440	254502-343782
	D-34-35-37	4	660	
			675	
	E-49	6	1385	
1918	E-4-34-35	4	795	
	E-6-44	6	1265	
	E-6-45-46	6	1265	
			1695	343783-480995
	E-6-49-50	6	1495	
			2175	

Number on left front side of frame member; engine number on left side crankcase

1919	H-44-45	6	1495	
	H-46-47	6	1985	
			2195	480996 up
	H-49-50	6	1785	
			2585	

Number on rear end of left frame member; engine number on left side crankcase

1920	K-44-50	6	1495	547524-689794

Number on left frame at rear.

CAMPBELL

Year	Model	Cyls.	Price	Serial Numbers
1918	....	4	$ 835	1-537
1919	C-4	4	1000	538 up

Number plate on left side of dash under hood.

CARROLL

Year	Model	Cyls.	Price	Serial Numbers
1920	C	6	....	321-1 to 321-105

Serial number on dash.

CADILLAC

Year	Model	Cyls.	Price	Serial Numbers
1912	1912	4	$1800	61006-75000
1913	1913	4	1975	75001-90018
1914	1914	4	1975	91005-99999
				A1-A5008
1915	Type 51	8	1975	A6000-A19001
1916	Type 53	8	2080	A20000-A38003
1917	Type 55	8	2080	
	before Dec. 14, 1917		$2240	55-A1-55-S2
	after Dec. 14. 1917			
1918-19	Type 57	8	3220	57-A1-57-1000—57-TT-146
1920	Type 59	8	3490	59-A-1

Number on left front of engine in four-cylinder models. Number back of the right cylinder block on eights. For 1917 and 1918 the figures in front of letter indicate type of car, the number following letter the number of engine for that particular letter. There are 1000 numbers for each letter of the alphabet.

1920	59-A	8	3490	59-A-1 to 59-V-636

Number stamped on the right rear corner of crank case at the rear of the right cylinder block. There are 1000 numbers for each letter of the alphabet, when all letters are used up double letters will be used.

CASE

Year	Model	Cyls.	Price	Serial Numbers
1912	M	4	$2050	15000-16224
1913	N	4	1500	19001-20253
	O	4	2200	22001-22750
1914	O	4	2300	
	R	4	1250	22751-26333
	S	4	1850	
1915	R	4	1350	26334-28340
1916	T	4	1190	28341-31350
1917	T-17	4	1190	31351-32354
1918	U-18	6	1875	32355-34856
	U-19		2100	
1920	V	6	2650	34860 to 37287

Number on dash and on front cross bar of frame.

CHAMPION (Formerly Direct Drive)

Year	Model	Cyls.	Price	Serial Numbers
1918	....	4	....	101-113 demonstrating models only
1919	C & CS	4	$1150	C-100—C-216
1920	C-4	4	....	C-300 up

Number plate on body under seat.

1920	Touring	4	$1350	100 to 299

Number on inside dash on instrument board.

CHALMERS

Year	Model	Cyls.	Price	Serial Numbers
1912	9	4	$1400	18001-19252
	10	4	1800	20001-24000
	11	4	1500	27001-29166
	12	6	3250	24001-24300
	14	4	1750	4901- 4950
1913	16	4	1600	24301-25300
	17	4	1950	29500-33499
	18	6	2400	25301-27000
1914	24	6	2175	34500-38499
1915	26-A	6	1800	
	26-B	6	1850	
	Aug. 1, 1914		1700	38600-44999
	Sept. 1, 1914		1650	
	26-C	6	1550	45000-45799
	29	6	2400	45801-47300
	June 1, 1915		2175	

Numbers from here on are by **models** and not by **year**.

	32-A	6	1400	47500-49599
	July 1, 1915		1275	
	32-B	6	1350	
	Aug. 1, 1915		1450	50600-56999
	April 1, 1916		1350	
	35-A	6	1050	55700-75699
	April 20, 1916		1090	
	35-B	6	1280	
	Jan. 1, 1917		1350	
	Nov. 1, 1917		1450	75700-82000
	Nov. 24, 1917		1535	
	April 8, 1918		1615	
	35-B	6	1765	
	July 12, 1919		1765	82000 up
	35-C	6	1250	
	Nov. 1, 1917		1365	
	Nov. 24, 1917		1485	94001 up
	April 8, 1918		1565	
	July 12, 1919		1685	

Number on 1915-16 models on left frame member under front boards. Number on 1916-17-18-19 models on left front horn of frame.

1920	Roadster	6	$1795	94001 to 110000
				111101 to 112000
	5-Passenger	6	1795	115001 to 200000
	7-Passenger	6	1945	200001 and up
	Sport	6	1995	115001 to 200000
	Coupe	6	2595	115001 to 200000
	Sedan	6	2745	111101 to 112000
				114001 to 114101

Number on brass plate on left horn of frame just in front of radiator.

CHANDLER

Year	Model	Cyls.	Price	Serial Numbers
1913	14	6	$1785	1-550
1914	15	6	1785	551-250
1915	15-B	6	1295	2501-4000
1916	16	6	1295	4001-15000
1917	17	6	1295	15001-35000
1918	New Series	6	....	35001-65000
1919	New Series	6	....	65001 up
1920	New Series	6	1895	

Number on right front engine arm up to car number 72000; cars numbered above 72000 the number is on frame under right headlight and fender.

Chandler cars are not listed by serial numbers for each year, but are classed as new series of the current model.

CHEVROLET

Year	Model	Cyls.	Price	Serial Numbers
1913	C	6	$2100	
1914	H-2	4	750	
	H-4	4	875	
	L	6	1475	
	C	6	2500	
1915	H-2	4	750	
	H-4	4	875	
	L	6	1425	
1916	490	4	490	
	H-4	4	750	
1917	490	4	490	
	F-5	4	800	
	D-5	8	1385	
1918	490	4	635	
	FA-5	4	935	
	D-4	8	1385	
	D-5	8	1385	
1919	FA-5	4	1045	
	D-4	8	1385	
	D-5	8	1385	
	FB-5	4	1135	
	490	4	735	
1920	FB-50	4	1135	
	490	4	735	
	T	4	1460	1-2284 to 1-4199
				2-2202 to 2-36617
				3-1301 to 3-1952
				6-1645 to 6-2362
				9-356 to 9-847
	FB Touring	4	1295	1-9385 to 1-20516
	FB Roadster	4	1270	2-4739 to 2-11448
	FB Sedan and Coupe	4	1855	3-54 to 3-1500
				6-1290 to 6-4990
				9-1336 to 9-4604
	490 Roadster	4	775	1-92475 to 1-A-20160
	490 Touring	4	795	2-90422 to 2-A-23673
	490 Coupe	4	1170	3-47101 to 3-70100
	490 Sedan	4	1245	6-36885 to 6-51094
				7-25430 to 7-34200
				9-28154 to 9-40225

As Chevrolet cars are numbered by manufacturing zones it is not possible to reproduce the numbers in such a way as to be of use to the dealer. In case of doubt write the Chevrolet Motor Co., 1764 Broadway, New York City.
Number on dash.

NOTE.—The numbers 1-2-3-6-7-9 before the serial numbers indicate the plant from which the car was made. No. 1 Plant, Flint; No. 2 Plant, New York and Tarrytown; No. 3 Plant, St. Louis; No. 6 Plant, Oakland; No. 7 Plant, Fort Worth; No. 9 Plant, Oshawa.

CLEVELAND

Year	Model	Cyls.	Price	Serial Numbers
1919	40	6	$1385	1001 up
1920	40 Touring	6	1385	3485 and up
	40 Roadster	6	....	3490 and up
	40 Sedan	6	....	3914 and up
	40 Coupe	6	....	1398 and up
	40 Chassis	6	....	4174 and up

Number plate on right hand frame members about 12 inches from frame; engine number front of crankcase under oil filler.

CLIMBER

Year	Model	Cyls.	Price	Serial Numbers
1920	T	4	$1465	213 to 320
	S	6	2395	1001 to 1112

Number on left front frame.

COMET

Year	Model	Cyls.	Price	Serial Numbers
1917-18	C-51	6	....	1-500
1919	C-52	6	....	500 up
1920	C-53	6	$2150	701 and up

Number under hood on dash, left side.

Motor Age Passenger Car Serial Numbers

COLE

Year	Model	Cyls.	Price	Serial Numbers
1912	Large 4	4	....	5000 to 7000
	Small 4	4	....	5000-7000
1913	4-40	4	....	9000-16000
	4-50	4	....	7000-9000
	60-Big 6	6	....	10000-11000
1914	Series 9	4	....	16000-17012
	Series 9	6	....	14000-15000
1915	660	6	....	15000-15175
	666	6	....	15175-16000
	Series 10	4	....	18000-20000
	Series 10, Little 6	6	....	20000-22000
	440	4	....	22000-23000
	650, Sensible 6	6	....	23000-24000
	651, Little 6	6	....	24000-25000
	850	8	....	27000-30000
1916	666, Big 6	6	....	15175-16000
	860, Series 30	8	....	30000-40000
1917	860, Series 40	8	....	40000-50000
1918, 1919	870	8	....	50000-59478
1920	870	8	....	59339 up
	870	8	$3250	
	871	8	3250	
	872	8	3250	
	878	8	4350	59000 approximate to
	879	8	4450	65000 approximate
	883	8	4250	
	884	8	4450	
	885	8	4450	

Number on right front spring hanger and on under right front seat cushion.

COMMONWEALTH

Year	Model	Cyls.	Price	Serial Numbers
1913	38	4	$ 975	A1000-A1366
1914	38	4	975	B203-A411
	20	4	495	B001-B174
1915	38	4	1075	A966-B36
	20	4	495	C195-CX17
1916	32	4	895	CX2-C194
1917	40	4	995	D219-D479
1918	40	4	995	DX732-DO883
1919	40	4	1395	 41999
1920	42	4	1395	42000 to 44000

Number plate on cowl.

CRAWFORD

Year	Model	Cyls.	Price	Serial Numbers
1912	12-30	4	$1600	
	12-40	4	2100	730-840
1913	13-30	4	1750	
	13-40	4	2100	841-926
1914	14-30	..	....	927-987
	14-40	4 & 6	1750	.....
1915	15-6-35	6	1850	
	15-40	..	2100	988-1090
1916	16-40	6	1650	1091-1195
1917	17-40	6	1750	1196-1234
1918	18-40	6	2250	1235-1294
1919	19-6-40	6	2500	1295-1337
1920	20-6-40	6	3000	1338 to 1650

Number on seat next to door.

CROW-ELKHART

Year	Model	Cyls.	Price	Serial Numbers
1914	D-45	4	$1245	
	D-55	4	1650	6000-6500
	D-56	4	1650	
1915	E-45	4	1145	
	E-65	6	2250	6501-7200
	E-66	6	2350	
	E-25	4	725	
1916	CE-30	4	725	7201-9025
	CE-33	4	795	
1917	CE-33	4	935	9026-13295
	CE-35	4	845	

Number plate on dash

1918	CE-32-34 & 36	4	995	13296-15292
1919	CE-32-34 & 36	4	1095	
	H-42-44		1355	15293-17411
	& 46	6		
1920	S-65-64-63-67	6	1745	18900 to 19930
	L-65-64-63	4	1495	18901 to 19933

Number on seat frame under front cushion.

CUNNINGHAM

Year	Model	Cyls.	Price	Serial Numbers
1912	J	4	....	181-305
1913	M	4	....	306-455
1914	R	4	....	456-755
1915	S	4	....	756-990
1916	V-1	8	....	991-1297
1917	V-2	8	....	1298-1597
1918-19	V-3	8	....	1601-2300
1920	V-3	8	....	2451 to 3000

Number on left frame member near radiator.

COLUMBIA

Year	Model	Cyls.	Price	Serial Numbers
1917	A	6	$1250	501-1310
	B	6	1345	1-297
1918	C	6	1350	2000-3199
	D	6	1450	501-889
	C-S	6	2445	1850-1950
1919	C	6	1600	3201-3389
	D	6	1745	1000-1132

Number on front seat heel board.

	E	6	1845	101 up
	H	6	2850	100 up
	C-S	6	2445	1951-1968
1920	C	6	1695	4000 and up
	D	6	1845	1400 and up
	E-CS	6	2850	2000 and up
	H	6	....	100 and up
	E-CS-H	6	....	10000 and up

Number on upper toe board.

DANIELS

Year	Model	Cyls.	Price	Serial Numbers
1916	A	8	....	103-257
1917	A	8	....	258-302
	B	8	....	401-560
1918	A	8	....	361-383
	B	8	....	561-741
1919	B	8	....	742-873

Number on top of front gearcase cover; engine number on crankcase near distributor.

1920	D	8	$4500	1100 and up
	C	8	....	1000 and up

Number on inside of dash.

DAVIS

Year	Model	Cyls.	Price	Serial Numbers

(Engine number used as car number up to and including 1918)

1912	40	4	$1850	Contin'tl C, 101-1800
1913	40	4	2000	Contin'tl C, 1801-4270
	50	4	2100	Contin'tl E, 4186-7569
1914	35	4	1335	Contin'tl 4N, 111-874
	Six-50	6	2150	Contin'tl 6P, 1023-2920
1915	38	4	1235	Contin'tl 4N, 1175-7082
	Six-50	6	2150	Contin'tl 6P, 1023-2920
1916	Six-F & G	6	1095	Contin'tl 7W, 1005-17650
	Six-E	6	1495	Contin'tl 6N, 1719-8693
1917	Six-H, I	6	1195	Contin'tl 7W, 17651-67452
	Six-K	6	1795	Contin'tl 7W, 17651-67452
	Six-J	6	1495	Contin'tl 7N, 14582-30983
1918	Six-H, I, L	6	1485	Contin'tl 7W, 5001-5600
	Six-K	6	1850	Contin'tl 7W, 5001-5600
1919	Six-H, I, L	6	1685	
	Six-N & P	6	2300	5001-6000
	Six-J, M	6	2050	

Number on left rear motor arm.

1920	51	6	$2185	
	52	6	2225	
	53	6	2350	
	54	6	3185	6001 to 7885
	55	6	3185	
	56	6	2225	
	57	6	2350	

Number on left side of crankcase.

DETROITER

Year	Model	Cyls.	Price	Serial Numbers
1916	F	4	$ 985	15000-20000
	6-45	6	1098	
1917	6-45	6	1195	20000 up

Discontinued. Number on dash plate.

DIRECT DRIVE—See Champion

DIXIE FLYER

Year	Model	Cyls.	Price	Serial Numbers
1916	L	4	$ 795	Under 2200
1917	L-X	4	895	2200-3500
1918	L-S	4	995	
			1095	3500-5000
1919	H-S-50	4	1365	5000 up
1920	H-S-50	4	1465	7001 to 11000

Number on dash at left hand spring horn.

DODGE

Year	Model	Cyls.	Price	Serial Numbers
11-14-14 to 10-31-17		4	....	1-200000
8-18-15 to 2- 1-18		4	....	25000-225000
2- 9-16 to 4-26-18		4	....	50000-250000
6-15-16 to 8- 8-18		4	....	75000-275000
10-23-16 to 12-13-18		4	....	100000-300000
2-17-17 to 3-19-19		4	....	125000-325000
5- 1-17 to 3-19-19		4	....	150000-250000
8- 3-17		4	....	175000-275000

Number stamped on frame under floor board; engine number on left side just above carburetor.

1920	Touring	4	$1185	
	Roadster	4	1185	423641 to 569548
	Sedan	4	2000	
	Coupe	4	1850	

Number stamped on the right head motor leg.

DISPATCH

Year	Model	Cyls.	Price	Serial Numbers
1920	D-G-1	4	$1350	B-20-1 and up
	H-E	4	....	B-20-1 and up

DORRIS

Year	Model	Cyls.	Price	Serial Numbers
1912	G	4	$2500	3001-3255
1913	H	4	2500	5001-5281
1914	I	4	2500	6001-6110

Number on front end crankshaft.

1915, 1916	I-A-4	4	2250	6111-6220
1916	I-A-6	6	2475	8001-8140
1917	I-B-6	6	2475	8141-8289
1918	I-C-6	6	2985	8300-8392

Number on name plate left side of motor.

1919	6-80	6	4350	8401-8658
1920	6-80	6	4350	8675 to 9000
				9017 to 9088

Serial number on top of crankcase.

DORT

Year	Model	Cyls.	Price	Serial Numbers
1915	M-4	4	$ 540	
	M-5		680	
1916	M-5A	4	725	
1917	M-6	4	695	
	M-9		695	9204-24368
	M-9S		1065	Up to Feb. 21, 1918
	M-9T		815	
1918-19	M-8	4	865	
	M-8C		1265	
	M-11		865	24369-49330
	M-11S		1265	Up to Oct. 4, 1918
	M-11T		1000	
1920	M-15		985	
	M-15S		1535	49331 up
	M-10		985	
	M-10C		1535	

Number on frame under left head lamp, also on shroud board.

	15	4	985	51673 to 77951

Starting number Nov. 1919. Ending Nov. 1920. Number on dash under hood.

ELCAR

Year	Model	Cyls.	Price	Serial Numbers
1916	A	4	....	500-2000
	B	4	....	500-2000
1917	D, E, F	4	....	2001-4999
1918	D, E, G	4	....	5000-5930
	D, E, G	6	....	10000-10860
1919	D, H, G	4	....	5931-9999
	D, H, G	6	....	10861-14999
1920	Touring	4	$1495	15000 and up
	Sportster	4	1495	15000 and up
	Coupe	4	2095	15000 and up
	Sedan	4	2195	15000 and up
	Touring	6	1795	25000 and up
	Sportster	6	2395	25000 and up
	Coupe	6	2395	25000 and up
	Sedan	6	2495	25000 and up

Number on dash.

ELGIN

Year	Model	Cyls.	Price	Serial Numbers
1916	6	6	$ 845	1-1720
1917	17	6	985	17-100—17-3900
	17	6	1095	17-3901—17-6964
1918	17	6	1165	17-6965—17-7400
	17	6	1235	17-7400—17-7764
1919	H	6	1395	101-1500
	H	6	1485	1501—2600
1920	K	6	1485	K-2601 to K-10638

Number plate on 1916-1917 and 1918 models, located on dash, right side, under hood. On Series H models, number plate on right front side. On Series H sedan models, number plate on dash, right side.

ESSEX

Year	Model	Cyls.	Price	Serial Numbers
1918			....	A-5000, A-34999, A-35000, A-39999
1919	A	4	$1595	5000-25000
			1595	60000-63000
			2250	70000-75004
1920	5-A to 7-A	4	....	5000 to 52999
	5-A to 7-A	4	....	53000 to 59999
	5-A to 7-A	4	....	60000 to 68999
	5-A to 7-A	4	....	69000 to 69999
	5-A to 7-A	4	....	70000 to 83999
	5-A to 7-A	4	....	84000 to 84999
	5-A to 7-A	4	....	85000 to 89499
	5-A to 7-A	4	....	89500 to 89999
		4	....	600000 to 749999
		4	....	750000 to 779999
		4	....	800000 to 834999
		4	....	835000 to 839999
	These numbers effective Dec. 1, 1920.	4	....	840000 to 848999
		4	....	849000 to 849999
		4	....	850000 to 874999
		4	....	875000 to 876999
		4	....	900000 to 907999
		4	....	908000 to 909999

Serial number on dash.

Motor Age Passenger Car Serial Numbers

EMPIRE

Year	Model	Cyls.	Price	Serial Numbers
1913-14	31	4	$ 950	315750-318672
1914	31-40	4	900	405101-406190
1915	33	4	975	331001-333300
	40	4	975	401001-401675
1916-17	45	4	935	451001-452603
	60	6	1095	601001-603412
1917-18	50	4	1125	50001 up
	70	6	1345	70001-70350
	70-A	6	1375	70A001-70A710
	73	6	1360	73001-73059

Discontinued
Number on heel board of front seat

F. R. P.

Year	Model	Cyls.	Price	Serial Numbers
1914	A-45 and B	4	$7000	1-100
1915	A-45 and B	4	7000	1-100
1916	A-45 and B	4	7000	1-100
1917	A-45 and B	4	7000	1-100
1918	B-45	4	....	

Name changed to Porter.

FORD

Year	Cyls.	Price	Serial Numbers
10- 1-12— 9-30-13	4	$ 690	15001-332500
10- 1-13— 7-31-14	4	....	332501-539000
8- 1-14— 7-31-15	4	....	539001-855500
8- 1-15— 7-31-16	4	....	855501-1362200
8- 1-16— 7-31-17	4	....	1362201-2113500
8- 1-17— 7-31-18	4	....	2113501-2756251
8- 1-18— 7-31-19	4	....	2756252-3277851
8- 1-19— 9-30-19	4	....	3277852-3429400
	4	525	3659971 to 4698420

Number stamped on left side cylinder block just above water inlet compression. Car and engine number the same from May 1, 1915.

FRANKLIN

Year	Model	Cyls.	Price	Serial Numbers
1912	G (Ser. 1)	4	....	12801-13180
	D(Ser. 1)	6	....	14401-14627
	H (Ser. 1)	6	....	9601-9660
	M (Ser. 1)	6	....	15201-15411
	GRbt.Ser.1	6	....	17001-17169
1913	G (Ser. 2)	4	....	13181-13329
	D (Ser. 2)	6	....	14628-14657
	H (Ser. 2)	6	....	9661-9687
	DTorp.Ser.2	6	....	14901-14921
	M (Ser. 2)	6	....	15412-15640
	K (Ser. 2)	6	....	10118-10204
	O (Ser. 2)	6	....	16003-16025
	GRbt.Ser.2	6	....	17170-17218
	M (Ser. 2)	6	....	15641-16215 and 18001-18105
	D (Ser. 3)	6	....	14658-14812
	H (Ser. 3)	6	....	9688-9752 and 9801-9815
	DTorp.Ser.3	6	....	14922-14975
	M (Ser. 4)	6	....	16216-16894 and 18106-18205
1914	M (Ser. 4)	6	....	16861-16894 and 18189-18205
	M (Ser. 5)			16895-17000 and 19000-19510
1915	M (Ser. 6)			19511-20643 and 18311-18527
	M (Ser. 7)			20644-21980 and 18528-18658
1916	M (Ser. 8)			21981-25234 and 18654-19000 26001-26175
	A (Ser. 9)			40001-59572 and 90001-100000 27001-28387
1917 1918 1919	B (Ser. 9)			29001 up
1920	S-9B Touring	6	$2850	68900 to 73476
	Sedan	6	3950	93852 to 95000
	Sedan	6	3950	95052 to 96500
	Sedan	6	3950	99101 to 99999
	Sedan	6	3950	80001 to 8345
	Brom.	6	3900	97371 to 98604
	4-Pass.	6	2850	41779 to 42427
	2-Pass.	6	2800	29843 to 30134
	Demi-Coupe	6	....	39101 to 39109
	Demi-Sedan	6	....	39500 to 39501

Number on rear sill of body.

GARDNER

Year	Model	Cyls.	Price	Serial Numbers
1920	G	4	$1125	1000 and up

Number on right hand side under front cushion.

GLIDE

Year	Model	Cyls.	Price	Serial Numbers
1913	45	4	$2150	1300-1400
1914	36	4	1890	5100-5600
1915	30	4	1195	7000-7600
1916	Lt. Six 40	6	1095	9000-9500
1917	Lt. Six 40	6	1125	9501-10000
1918	Lt. Six 40	6	1655	10001-10555

Discontinued.
Numbers on models up to 10000 on name plate inside channel of the front frame horn. Number on cars from 10000 to 10555 on instrument board.

GERONIMO

Year	Model	Cyls.	Price	Serial Numbers
1918	6A-45	6	$1550	400-500
1919	6A-45	6	1550	501-650

Number plate on front of cowl.

GRANT

Year	Model	Cyls.	Price	Serial Numbers
1914	M	4	$ 495	0-3033
1915	T	6	750	5000-7053
1916	V	6	795	10000-14002
1917	K	6	825	15000-27000
1918	G	6	1055	30001-40001
1919		6	1120	
1920	H	6	1550	50001 and up
	HY	6	1550	51700 and up
	HX	6	1785	51300 and up

Number on dash under hood.

HACKETT (Name changed to Lorraine in December, 1919)

Year	Model	Cyls.	Price	Serial Numbers
1917	5-pass.	4	$ 885	50-501
1918	5-pass.	4	985	534-594
1919	5-pass.	4	1125	601-694

Number on dash under hood, and on end of frame.

HALLADAY

Year	Model	Cyls.	Price	Serial Numbers
1920	20	6	$1885	20001-20999

Number on dash.

HAL

Year	Model	Cyls.	Price	Serial Numbers
1916	12	12	$2100	Can be distinguished by straight windshields and carpet paneling on back of front seat.
	12	12	2385	Introduced September, 1916. Can be recognized by walnut paneling on front seat back.
1917	12	12	2600	A new pocket-style tire carrier is fitted.
1918	25	12	3600	

Discontinued.

HATFIELD

Year	Model	Cyls.	Price	Serial Numbers
1919	A-42	4	....	—— 678
1920	A-42	4	....	700 up

HAYNES

Year	Model	Cyls.	Price	Serial Numbers
1912	A-21	4	$2100	
	B-21	4	2450	
	C-21	4	2750	
	AY	4	3000	3036-4851
	Y	4	3800-3900	
	22	4	2250-2750	
1913	22	4	3400-3500	
	23	6	2500	5000-6550
	24	4	1785	
	25	6	2700	
1914	26	6	2700-3200	
	27	6	2785-3830	6601-8499
	28	4	1985-2700	
1915	32	4	1660-2500	
	30	6	1485	8552-10949
	31	6	2250-3000	
	33	6	1550	
1916	34	6	1385	
	34	6	1485	
	35	6	1495	
	37	6	1725-2250	10951-15999
	36	6	1595-1750-2150	
	41	12	2225-2890	21000-24000
	40	12	2095-2760	
1917	36	6	1595-2260	16002 up
	37	6	1725-2390	
1918	38-39	6	2150-3250	29650 up
	44	12	2910-3985	21000-24000
1919-20	45	6	2685-4200	32804 up
	46	12	3450-4200	21364 up

Number plate on cowl at extreme right; also on timing gear housing.

1920	47	6	....	38000 and up

Number on dash.

HANSON

Year	Model	Cyls.	Price	Serial Numbers
1918	A-45	6	$1685	1001-1025
1919	A-45	6	1685	1026-1625
1920	....	6	....	1700 up

Number on right side heel board under front seat; engine numbers left side crank case.

HARROUN

Year	Model	Cyls.	Price	Serial Numbers
1917	A-A-1	4	$695	101-549
1918	A-A-1	4	895	550-2381
1919	A-A-1	4	995	2382-2624

Number plate on right side front seat, under cushion.

H. C. S.

1920	2	4	$2975	1-550

Number on dash.

HOLLIER

Year	Model	Cyls.	Price	Serial Numbers
1915	158T	8	$ 985	1-580
	158R	8	985	1-60
1916	168T	8	985	580-623
1917	176T	6	1085	1-35
	176R	6	1085	1-35
	178R	8	1185	1-51
1918	186T	6	1185	
	188T	8	1385	6194-7010
1919	206T	6	1785	10001-10083
1920	206B	6	1985	10083 up

Number on heel board of front seat.

HOLMES

Year	Model	Cyls.	Price	Serial Numbers
1918	1	6	$2900	1-500
1919	2	6	2900	500 up
1920	3 Touring	6	3350	
	3 Roadster	6	....	
	3 Sedan	6	....	19851 to 40000
	3 Coupe	6	....	

Number on right side rear end of frame.

HOWARD—See Lexington

HUDSON

Year	Model	Cyls.	Price	Serial Numbers
1912	33	4	....	15001-30000
1913	37	4	....	30001-56500
1914	54	6	....	56501-61700
	40	6	....	63001-77201
1915	40	4	....	73501-90000
	54	6	....	59001-62000
1916	40	4	....	G10001-G40000
1917	H	6	....	H1-H99999
	J	6	....	1-96499
	4J	6	....	75000-97999
1918	M	6	....	5000-97499
1919	O	6	....	5000-90999
1920	O	6	$2600	5000 to 26999
				27000 to 29999
				30000 to 48999
				49000 to 49999
				50000 to 59499
				59500 to 59999
				60000 to 61899
				61900 to 61999
				70000 to 79999
				81000 to 81999
				82000 to 83999
				84000 to 84999
				90000 to 91499
				91500 to 91999
These numbers effective Dec. 1, 1920				100000 to 174999
				175000 to 199999
				200000 to 274999
				275000 to 299999
				300000 to 328999
				329000 to 329999
				330000 to 348999
				349000 to 349999
				350000 to 358999
				359000 to 359999
				360000 to 363999
				364000 to 364999
				370000 to 373999
				374000 to 374999
	O	6	....	380000 to 384999
				385000 to 389999

Numbers on all cars in right hand frame. Also on left side dash under hood. Cars are not designated by yearly models, but by a prefix letter such as H, J, M, O.

INTER STATE

Year	Model	Cyls.	Price	Serial Numbers
1912	30-32	4	$1750	
	40-41-42	4	2400	4101-6000
	50-51-52	4	3400	
1913	45	6	2750	
1914	....	..	....	6001-7099
1915	T	4	1000	7100-11503
1916	T	4	850	11504-14528
1917	T	4	850	14529-19108
1918	T	4	1000	19109 up

Discontinued. Number plate under front seat.

Motor Age Passenger Car Serial Numbers

HUFFMAN

Year	Model	Cyls.	Price	Serial Numbers
1919	W	6	$1795	
1920	R	6	1995	1776 to 2814

Number on right front frame horn.

HUPMOBILE

Year	Model	Cyls.	Price	Serial Numbers
1912	16-20	4	$ 750	
	20	4	900	25001-28902
1913	20	4	750	
	H	4	1000	
			1100	28903-40000
1914	H A	4	1200	
	32	4	1050	40001-52000

Number on sector plate center of dash.

1915	K	4	1200	52001-60000
	N	4	1085	
1916	N	4	1185	
	N U	4	1340	
1917	N	4	1285	60000-87519
	N U	4	1440	
	N	4	1385	
	N U	4	1540	

Number plate on dash near speedometer.

1918	R	4	1250	
			1350	R1-R15000
			1350	
1919	R	4	1335	
	R3	4	1450	R20001 up

Number plate on dash at steering column.

1920	R-3	4	$1685	29000 to 30000
	R-4	4	1685	30001 to 39999
	R-5	4	1685	40000 and up

Number on plate inside cowl.

JACKSON

Year	Model	Cyls.	Price	Serial Numbers
1912	26-27-28 32—32AC	4	$1100	
	36	4	1650	
	42 and 45	4	1500	
	52	4	1800	
	32-Special	4	1100	
1913	33	4	1500	
	43	4	1850	
	53	6	2150	
			2300	
1914	33	4	1500	
	43	4	1850	
	53	6	2150	
			2300	Numbers do not run consecutively.
1915	44	4	1135	
	48	6	1650	
1916	34	4	985	
	46	4	1375	
	348	8	1195	
	68	8	1685	
1917	34-A	4	985	
	348-A	8	1195	
	68-A	8	1685	
	349	8	1295	
	350	8	1195	
1918	349	8	1495	
			2195	

Number plate on dash or on front seat heel board.

1920	6-38	6	$2150	25000 to 27842

Number on end of front seat.

JEFFERY

Year	Model	Cyls.	Price	Serial Numbers
1913	42 H. P.	4	$1700	31551-35999
1914	38	4	1550	40000-46999
	48	6	2250	38000-38999
1915	Six	6	1650	47000-53999
1916	4-62	4	1000	57000-60500
	6	6	1350	68000-69500
1917	472	4	1095	61000-78000
	671	6	1465	86000-96000

For later models see Nash.
Number to left of front frame cross member.

JONES

Year	Model	Cyls.	Price	Serial Numbers
1915	1915	6	....	1-1999
1916	1916	6	....	2000-2999
1917	26-A	6	....	3000-5000
	26-B	6	....	
1918	27-A	6	....	
	27-B	6	....	5001-6000
	27-C	6	....	
	29-D	6	....	
1919-20	27-A	6	....	
	27-B	6	....	
	27-C	6	....	6001 up
	27-D	6	....	
	27-E	6	....	

Number under the hood, on right side of cowl board, and stamped on ends of both front spring hangers.

JORDAN

Year	Model	Cyls.	Price	Serial Numbers
1917	60	6	$1650	151-2157
1918	60	6	1995	2157-5298
1919	F	6	2775	5401 up
1920	M	6	2450	10001 up

Number under hood.

KING

Year	Model	Cyls.	Price	Serial Numbers
1912	36	4	$1565	100-550
1913	A	4	1350	600-999
1914	B	4	1095	1000-2200
1915	C	4	1150	2201-3005
	D	8	1350	
1916	D	8	1350	4000-8000
	E	8	1585	12000-14950
1917	EE 1st Ser.	8	1650	16000-17800
	EE 2d Ser.	8	1650	18000-18099
1918	F	8	2150	20001-25000
1919	G	8	2350	30001-30629, 32976, 36378, 35022
1920	H	8	....	H-1, H-2001, H-4001 and H-5001 up

Numbers on dash plate, except 1915 models, which are on heel board under front seat.

1920	Touring	8	....	1000 to 2000
	Foursome	8	....	2001 to 4000
	Road King	8	....	4001 to 5000
	Limousine	8	....	5001 to 6000

Number below cushion on heel board.

KISSEL KAR

Year	Model	Cyls.	Price	Serial Numbers
1912	30	4	$1500	3001-4000
	40	4	1850	7001-7400
	50	4	2350	6001-6300
1913	L D 13	4	1700	10500 ——
	H 13	4	2000	7401-10000
	D 13	4	2500	6301-7000
1914	40	4	1850	15001-15601
	48	6	2350	20001-30000
	60	6	3150	4601-6000
1915	4-36	4	1450	16001-16575
	6-42	6	1850	25001-25455
1916	32-4	4	1050	30001-33001
	36-4	4	1250	16576-20000
	42-6	6	1485	25456 ——
1917	100 pt. 6	6	1195	38-101 up
	Double 6	12	2250	12-101 up
1918	100 pt. 6	6	1495	
	Double 6	12	2250	
1919	Cus. Bld.	6	2875	45-101 up
	Cus. Bld.	6	2450	45-200 up
1920	Cus. Bld.	6	3475	

Number plate on dash under hood. On models built since 1915 car number stamped on front end right frame member adjacent to right head-lamp. Engine number on right front motor arm. Numbers are not given in years as the numbers do not close one year to begin another.

KLINE

Year	Model	Cyls.	Price	Serial Numbers
1915	6-42A	6	$1750	2100-2500
1916	6-36E	6	1095	3000-3599
1917	6-38F	6	1295	3600-4500
	6-38G	6	1395	4600-4999
1918	6-38GA	6	1495	5000-5800
1919	6-42	6	1865	6000-7000
1919-20	6-55-J	6	1965	7000 to 7999
			2290	7000 to 7999

Number plate on right front seat floor board.

LIBERTY

Year	Model	Cyls.	Price	Serial Numbers
1916	10-A	6	$1095	30501-31500
1917	10-B	6	1195	31501-33500 approx.
1918	10-B	6	....	33501-36450
1919	10-B	6	....	36451-42250
1920	10-C	6	1985	50500 up

Numbers on left side front frame end; motor numbers, 21001 to 27001, on left side of motor.

LAFAYETTE

	8	8	$5625	1001 and up

Number on front floor board.

LEXINGTON (Formerly Howard)

Year	Model	Cyls.	Price	Serial Numbers
1913	D-F	4	$1750	
	G	6	2500	

Number plate on tonneau floor board.

1914	4-H	4	1335	
1915	4-K	4	1375	
	6-L	6	1875	
	6-M	6	2575	
1916	6-N	6	1875	

Number plate on dash, right side, under hood.

	6-O-16	6	1075	
1917	6-O-17	6	1185-1285	

Number plate on dash, right side under hood, and on top of fly-wheel housing.

	6-P	6	2875	

Number plate on dash, right side under hood.

1918	O	6	1345	
	R	6	1585-1685	

Number plate on dash, right side under hood, left front spring and on left rear kick-up.

1919	R-19	6	1785	17296
1920	S	6	1885	18001 up

Number plate on dash, right side under hood, on left front spring crown, left rear motor arm, and on right side of rear side rail. Number on right front spring hanger.

LENOX

Year	Model	Cyls.	Price	Serial Numbers
1912	AB BB			
	CB DB	4	$1800	100-215
1913	AC DC	4	2000	1000-2000
	MC	6	2750	15-1525
1914	A D	4	2000	2000-2015
	M	6	2465	1525-1550
1915	A1 D1	4	2000	2015
	M1	6	2465	1551-1563
1916	O	6	2500	2500
1917	O	6	2510	2530
1918	Ser 33	6	2550	2554

LINCOLN

Year	Model	Cyls.	Price	Serial Numbers
1920		8	$4600	1 and up

LOCOMOBILE

Year	Model	Cyls.	Price	Serial Numbers
1912	L	4	$3500	
	M	6	4800	
1913	L	4	3600	
	R	6	4400	
	M	6	5100	
1914	38 RD & LD	6	4400	
	48 RD & LD	6	5100	
1915	38R-5	6	4400	
	48M-5	6	5100	(Decline to give serial numbers)
1916	38	6	4400	
	48	6	5100	
1917	38	6	4600	
	48	6	4600	
1918	38	6	5000	
	48	6	5950	
1919	38	6	....	
	48	6	....	
1920	38	6	....	
	48	6	8100	17001 and up

Number on right side of dash column.

MAIBOHM

Year	Model	Cyls.	Price	Serial Numbers
1917	A	4	$ 830	1-500

Number plate on dash or under front seat.

1918	B	6	$1290	501-2350
1919	B	6	1395	2351-6200
1920	B	6	1495	6300 to 8299

Number plate on left side engine. Engine number same as car number.

MARMON

Year	Model	Cyls.	Price	Serial Numbers
1912	32	4	$2750	112001-1212001
1913	32	4	3000	2113001-2813001
	48	6	5000	1113002-1813000
1914	41	6	3250	114002-814000
	48	6	5000	1114002-1814000
1915	41	6	3250	115002-815000
	48	6	5000	1215002-1815000
1916	41	6	3250	116002-816000
	34	6	2750	1516002-1816000
1917	34	6	3100-5500	317002-817000
1918	34	6	3550-6500	418002-818000
1919	34	6	3950-5750	419001-819001
1920	34	6	4650-6450	2200001-8200001

Numbers on heel board of driver's seat and on left side of main frame.

MAXWELL

Year	Model	Cyls.	Price	Serial Numbers
1912	16	2	$ 625	
	25	4	950	
	30	4	1150	
	36	4	1480	
1913	22	4	785	
	30	4	1145	
	40	4	1675	
1914	25	4	750	
	35	4	1225	1-14000
	50-6	6	1975	
1915	25	4	695	
			Gas Light	14001-52000
			750	
			Electric Light	52001-113205
1916	25	4	655	
1917	25 7- 1-16	4	595	
	1- 1-17	4	635	113206-193800
	1- 1-17	4	665	
1918	25 7- 1-17	4	655	
	8- 6-17	4	745	193801-239822
	3- 1-18	4	825	
1919	25 7- 1-18	4	825	
	10- 4-18	4	895	239823-266800
1920	25 7- 1-19	4	895	
	7-12-19	4	985	266801 up

Number on name plate on right end of front seat base. Number on roadster appears on left side of driver's seat.

Motor Age Passenger Car Serial Numbers

LORRAINE (Previous to 1920, see Hackett)

Year	Model	Cyls.	Price	Serial Numbers
1920	20T	4	$1575	999 to 1999

Number on dash.

MERCER

Year	Model	Cyls.	Price	Serial Numbers
1912	35R	4	$2500	
	35 AB	4	2750	588-990
1913	J & K	4	2700	
	G	4	2900	991-1590
1914	35J	4	2600	
	35 HO	4	2900	1591-2098
1915	22-70	4	3000	2099-2549
1916	22-72	4	3000	2550-3299
1917	22-73	4	3500	3300-4099
1918	Series 4	4	4200	
			4500	4100-4600
1919	Series 5	4	4200	
			4500	4600 up
1920	Series 5	4	4950	9001 and up

Number on right hand rear spring hanger.

METEOR

Year	Model	Cyls.	Price	Serial Numbers
1920	R	4	$5000	625 and up

Number attached to clutch.

METZ

Year	Model	Cyls.	Price	Serial Numbers
1912	22	4	$ 495	15000-18301
1913	22	4	495	18302-22949
1914	22	4	475	22950-28800
	(Also 300 cars numbered from 28801 to 29100 on which equipment determines model).			
1915	22	4	$ 495	29101-32200
	(All the above have double chain drive and 22 H. P. engine and are roadsters.)			
	25	4	600	33000-36380
1916	25	4	600	36381-40248
1917	25	4	545	
1918	25	4	695	40249-44552
1919	Master Six	6	1695	45015-47508
1920	Master Six	6	1995	50646 to 51527

Number same as motor number, and is found on side of motor.

MITCHELL

Year	Model	Cyls.	Price	Serial Numbers
1912	2-4 4-4 5-4	4	....	22000-30000
	2-6 5-6 7-6	6	....	
1913	2-4 5-4	4	....	30001-31500
	2-6 5-6	6	....	35000-36284
	7-6	6	....	39500-39668
1914	A-40	4	....	40501-41500
	A-50	6	....	44001-46000
	A-60	6	....	49001-49250
1915	B-35	4	....	50001-51800
	B-45	6	....	55001-56000
	B-48	8	....	57001-57100

Number plate on heel board of front seat on right engine guard, and on left front frame member.

1916	B-48	8	....	58000-60000
	C-42	6	....	60001-64905
1917	C-42	6	....	65001-69956
1917	D-40	6	....	70000-85000
1918	C-42	6	....	90000-95000
1919	E-42	6	....	95501-96495
1920	E-40	6	1475	97001 to 106400
	E-42	6	1675	95501 to 96500
	F-40	6	1750	1 and up
	F-42	6	1995	12001 and up

Number on toe board. Serial numbers not carried under yearly designations.

MONITOR

Year	Model	Cyls.	Price	Serial Numbers
1920	M	6	$1575	3316 to 4200

Number on end of right side.

MOLINE

Year	Model	Cyls.	Price	Serial Numbers
1912	M	4	$1700	2362-2785
1913	M-40	4	1950	2786-3999
			2500	
1914	M-50	4	3250	4001-4999
			3800	
1915	MK-40	4	1375	6001-6250
1916	MK-40	4	1450	6250-7012
1917	G-50	4	1840	8000-8330
	C-40	4	1495	9000-10999
1918	G-50	4	2250	8331-8450
	L-40	4	2000	11000-11220
			2500	
1919	G-50	4	2250	8451-8999
	L-40	4	2000	
			2500	11221-11600

Name changed to R & V Knight in December, 1919
Name on dash plate and on front left side of engine.

MONROE (Indianapolis)

Year	Model	Cyls.	Price	Serial Numbers
1919	S-9	4	$1295	16609
1920	S-9	4	1195	15590 to 18374
	S-10.....	4	1195	

Number under hood right side of dash.

McFARLAN

Year	Model	Cyls.	Price	Serial Numbers
1912	26	6	$2100	500-1000
1913	27	6	2590	3000-4000
1914	65	6	2900	4000-6000
1915	77	6	2900	6000-7000
1916	107	6	2900	9000-10000
1917	127	6	3200	10000-11000
1918	127	6	3900-4300	18000 up
1919	127	6	....	19000-19999
1920	142-151	6	4800	20000 to 21000

Number plate on dash and on right frame horn.

MONROE (Pontiac, Mich.)

Year	Model	Cyls.	Price	Serial Numbers
1915	2	4	$ 495	501 up
1916	4	4	1095	8000 up
1917	3	4	565	4001 up
	6	4	1095	9151 up
1918	M-4	4	995	

MOON

Year	Model	Cyls.	Price	Serial Numbers
1912	30	..	....	5371-5470
	40	..	....	6022-7000
	48	..	....	7002-7119
1913	30	..	....	5472-5483
	39	..	....	8001-8365
	48	..	....	7121-7293
	6-50	..	....	31002-31081
1914	42	..	....	13001-14344
	4-38	..	....	14401-14453
	6-50	..	....	31082-41351
	6-40	..	....	61304-61530
1915	4-38	..	....	14451-14500
	6-30	..	....	70000-70242
	6-40	..	....	61531-61953
	6-50	..	....	41354-41891
1916	6-30	..	....	70245-70666
	6-43	..	....	70667-71087
	6-44	..	....	62053-62252
	6-66	..	....	62253-66564
1917	6-43	..	....	71088-71393
	6-45	..	....	71394-71819
	6-66	..	....	66565-66884
	6-36	..	....	36000-36225
1918	6-36	..	....	36226-36996
	6-66	..	....	66885-67043
1919	6-46 Victory	..	....	46001-47551
	6-66	..	....	67044-66078
1920	6-48	6	$1885	48001 to 49317
	6-68	6	....	68101 to 68286

Numbers are up to Sept. 15, 1920.
Number on dash.

MOORE

Year	Model	Cyls.	Price	Serial Numbers
1919	30	4	$895	1600
		4	995	7000-8149
		4	1095	8000
1920	30	4	1095	8150 up

Number under hood on right side of body; engine number on right side engine.

NATIONAL

Year	Model	Cyls.	Price	Serial Numbers
1912	MCC	4	$2900	5501-7000
1913	M3C	4	3300	7001-8100
	V-3	4	3400	8101-9000
1914	6-W	6	2375	9001-10100
1915	AA	6	2375	10101-11100
1915-16	AB	6	2500	11101-14000
1916	AC	6	1690	14001-16000
	AD	12	1990	16001-17000
1917	AE	6	1750	17003-18000
	AH	12	2150	18001-20000
	AF-1	6	1995	20001-24000
	AF-2	6	2150	24001-25000
	AK-1	12	2595	25001-25550
1918	AK-2	12	2750	25551-27000
	AF-3	6	2150	27001-28000
1919	AL	6	2450	28001-28979
	AM	12	3050	32000-32148
1920	BB	6	3290	60000 up
	Sextet (6)	6	....	32149 and up

Numbers on cars up to 1913 inclusive will be found riveted to the rear cross member of the frame. All cars after 1913 have the serial number on the left side of the frame, either under the front or rear fender.

NELSON

Year	Model	Cyls.	Price	Serial Numbers
1917	A	4	$1800	1001-1082
	BB	4	1290	1004-1125
	C	4	1400	1059-1101
1918	D	4	1450	1112-1187
1919	D	4	1500	1188 up
1920	D	4	1700	1213 to 1500

Number on dash plate; engine number top of right front crank-case arm.

NOMA

Year	Model	Cyls.	Price	Serial Numbers
1920	1	6	$2900	300 to 600

Number on front spring.

NASH (Formerly Jeffery) No yearly models

Year	Model	Cyls.	Price	Serial Numbers
	681, 5-P Spt.	6	....	100101-100114
	681	6	....	100612-111600
				127851-131825
	682, 7-P Tr.	6	....	111601-113601
	683	6	....	121001-122500
	684, Sedan	6	....	100108-100611
				119851-121000
				144331 up
	685, Coupe	6	....	94501-95000
				119913-119928
				144806-145405
				131851, 133251, 133351 up
	687, 4-P Rd	..	....	

Number on left front cross member, just back of radiator.

1920				Serial numbers on application.

OAKLAND

Year	Model	Cyls.	Price	Serial Numbers
1912	30	4	$1200	7001-8000
				11001-11500
	40	4	1450	8001-9000
				9650-11000
	45	4	2100	9001-9500
1918	35	4	1075	35001-37500
	42	4	1600	40001-43601
	60	6	2400	60001-60951
1914	36	4	1200	360000-364000
	48	6	1785	480000-481150
	62	6	2500	620000-620100
1915	37	4	1200	370000-373599
	49	6	1685	490000-490500

Number on front heel board

1916	32	6	795	320000-328000
				330000-347100
	38	4	1050	380000-384001
1916-17	50	8	1585	500000-502000

Number on heel board of driver's compartment, or on left rear cross frame member.

1917	34	6	875	134-3000034
1918	34-B	6	....	3000134 up
1919	34-B	6	....	11699934
1920	34-C	6	1165	11700134 to 15235634

1918 number on heel board; 1919 on heel board and on right rear side member.

OLDSMOBILE

Year	Model	Cyls.	Price	Serial Numbers
1913	40	4	$2500	80325-80999
	53	6	3200	81000-81500
1914	54	6	2975	83000-83999
	42	4	1285	84001-84399
1915	42	4	1285	84500-92499
	55	6	2975	92500-92999
1916	43	4	1095	93000-99999
	43	4	1095	109000-109499
	44	8	1195	
			1775	109500-118782
			1850	
1917	45	8	1775	
			1295	
			1850	119000-135276
			1367	
	45	8	1295	143000-144500
		8	....	148900-148925
	37	6	1095	150000 up
			1675	192000-200000
			1295	
1918	45A	8	1700	135277-142999
				145000-149999
1919	37A	6	1395	37AT1 & 37AR1 up
			1895	37AS1 & 37AC1 up
	45B	8	1895	45BT1, 45BP1 & 45BS1 up
1920	45-B Touring	8	1395	45-B-T-1 to 45-B-T 8297
	45-B-P (Sport)	8	....	45-B-P-1 to 45-B-T 3062
	45-B-R-T Tour.	8	....	45-B-R-T-1 to 45-B-R-T 599
	45-B Sedan	8	....	45-B-S-1 to 45-B-S 1032

Numbers on right, on cowl under hood on brass plate.

PACKARD

Year	Model	Cyls.	Price	Serial Numbers
1912	30	4	$4200	20001-230000
	48	..	....	23001-26000
	18	4	3200	26001-27000
1913	48	6	4850	35026-38000
1914	1-38	6	4150	38000-42000
	48	6	4850	50026-52000
	2-38	6	3350	53026-56000
	48	..	....	63026-66000
1915	3-38	6	3750	75026-76999
	5-48	6	4850	78026-78386
1916	1-25	12	2750	80026-90000
	1-35	12	....	
	2-25	12	....	125051-150000
	2-35	12	....	
1917	2-25	12	3050	
	2-35	12	3500	
1918	3-25	12	3700	150051 up
	3-35	12	4100	
1919	3-25	12	3950	
	3-35	12	4300	
1920	Twin Six	12	5550	160130 to 165662

Number on right front leg of motor.

Motor Age Passenger Car Serial Numbers

NORWALK

Year	Model	Cyls.	Price	Serial Numbers
1920	4-30	4	....	9000 to 9872

Number on dash.

OVERLAND

Year	Model	Cyls.	Price	Serial Numbers
1912	58	4	....	1-250
	59	4	....	1-13250
	60	4	....	1-6656
	61	4	....	1-2300
1913	69	4	....	1-26354
	71	4	....	1-3000
1914	79	4	....	1-44995
1915	80	4	....	1-19993
	81	4	....	1-20399
	82	6	....	1-2846
1916	84	4	....	1-14080
	86	6	....	1-12008
	83 & 83B	4	....	1-101976
1916-17	75 & 75B	4	....	1-65693
1917-18	83 B. O. E.	4	....	
	85-4	4	....	1-51892
	85-6	6	....	1-18459
	90 & 90B	4	....	1

Number under front seat cushion stamped on front spring right hanger, or front end right side frame rail, except model 90 which is on right rear frame end.

1919	4	4	$845	100-31000
1920	4	4	945	Unable to get information from manufacturer.

Number on left frame.

PAN-AMERICAN

Year	Model	Cyls.	Price	Serial Numbers
1918	E-6-48	6	$1800	500-1200

Number on frame horn.

1919	E-6-48 F-6-48 G-6-48	6	....	3000-3322
1920	E-6-55	6	2250	3000 and up

Number on left front spring hanger.

PAIGE

Year	Model	Cyls.	Price	Serial Numbers
1911-12	25	4	$ 975 1000	3000-4499
1912-13	25	4	975 1000	4500-6999
1913	25	4	975	7000-9170
1914	25	4	975	9171-9999
1913-14	36	4	1275	10001-14000
1914-15	36	4	1075	14000-20000
	46	6	1395	55000-59999
1915-16	36	6	1095	80000-81500
	46	6	1295	60000-66000
1916-18	46	6	1375	65600-69999
	38	6	1090	85000-89923
1917-18	39	..	1330	89924-101999
1918	39	6	1395	102001 up
	39	6	1690	102001 up
1917-18	51	6	1495	70000-74999
	55	6	2060	75000-79500
1919	55	6	2060	82001 up
	55	6	2165	82001 up

Number plate under left front seat cushion.

1920	15-19	6	1595	200000 and up
	M-18	6	2195	118000 and up

Serial and motor numbers are together on the left side of motor.

PATERSON

Year	Model	Cyls.	Price	Serial Numbers
1912	G	4	$1600	4001-4425
	H	4	1850	
1913	45	4	....	6001-6350
	47	4	1850	8001-8052
1914	33	4	1200	9300-9700
	32	4	1200	9010-9059
1915	6-48	6	1400	1000-1101
	4-32	4	1200	X100-X573
1916	6-42	6	995	301-1302
1917	6-45	6	....	5001-6986
1918-19	6-46	6	....	6869-9504
1920	6-47	6	....	12001 up 12101 up
	6-50	6	2100	1500 and up
	6-50	6	2130	
	6-50	6 Sedan 6 Coupe	3300 3300	18000 and up 18100 and up

Number on left side of seat.

PATHFINDER

Year	Model	Cyls.	Price	Serial Numbers
1912	12	4	$1750	500-802
1913	13	4	2185	1000-1342
1914	14	4	2185	
	14	6	2750	1500-1716
1915	....	..	2222	
	....	..	2750	2002-2566
1916	Six	6	1695	
	Twelve	12	2475	2901-4175
1917	3-B	12	2750	8001-17525

Discontinued. Number on dash plate.

PEERLESS

Year	Model	Cyls.	Price	Serial Numbers
1912	33	4	$4300	12001-12900
	35	6	4000	121001-121296
	36	6	5000	122001-122439
	37	6	6000	123001-123068
1913	35	6	4300	131001-131251
	36	6	5000	132001-132386
	37	6	6000	120368-123123
1914	36	6	5000	142001-142589
	37	6	6000	143001-143058
1915	36	6	5000	152001-152100
	54	4	2000	DD101-DD2500
	55	6	2250	EE101-EE5000
1916	Series 1	8	1890	160001-169000*
1917	Series 2 & 3	8	1890	170001-179000
1918	Series 4	8	2340	230001 up

*To March 21

1919	Series 5	8	2900	260000 to 266900
1920	Series 6	8	....	

Since 1916 series models instead of yearly models adopted. Number on dash.

PILOT

Year	Model	Cyls.	Price	Serial Numbers
1912	40	4	$1800	400-500
1913	40	4	2000	
	50	4	2250	1400-1550
	60	6	2500	
1914	50	4	2500	1551-1621
	60	6	2785	
1915	55	6	1885	1700-1755
1916	6-45	6	1100	
	6-55	6	1685	1756-2070
	8-55	8	1785	
1917	6-45	6	1150	2071-2999
1918	6-45	6	1295	3000-3575
1919	6-45	6	1650	3575 up

Number on left frame horn.

1920	6-45 5 pass. Tour.	6	1895	
	6-45 4 Pass. Road.	6	1945	4380 to 5044
	6-45 5 Pass. Sedan	6	2900	
	6-45 4 Pass. Coupe	6	2850	

Number on left front frame horn.

PIERCE-ARROW

Year	Model	Cyls.	Price	Serial Numbers
1912	36 H. P.	6	$4000	32200-33200 9199-9201-57
	48 H. P.	6	5000	9259-9321, 9323-9522 9524-42, 9544-9667, 9669-9684, 9686-9769, 9771-10000, 10002-8, 10010.
	66 H. P.	6	6000	10012-19, 10021-26, 10028-35, 10037-58, 10060-1, 10064-5, 10077-8, 10083, 10088, 10095-10105, 10122, 10126-7, 66298-66500
1913	38-C	6	4300	33301-34050
	48-B	6	5000	10301-11125 9543, 9668, 9685, 9770, 10001, 10009, 10011, 10059, 10062-3, 10066-76, 10079-82, 10084-87, 10089-94, 10106-9, 10111-
	48-D	6	5000	12, 10115-16, 10118-19, 10121, 10123-25, 10128-32, 10137, 10139-40, 10159, 10165, 10187-8, 10197-8
	48-D2	6	5000	9200, 9258, 9322, 9523, 10020, 10027, 10036, 10110, 10113-4, 10117, 10120, 10133-6, 10138, 10141-9, 10150-3, 10154-8, 10160-4, 10166-86, 10189-96, 10199, 10200
	66-A1	6	6000	66601-66800
1914	38-C2	6	4300	34101-34603 and 34047
	48-B2	6	5000	11201-12100 and 11100
	66-A2	6	6000	66900-66964
1915	38-C3	6	4300	34701-35450
	48-B3	6	5000	12301-13050
	6-A3	6	6000	67050-67150
1916	38-C3	6	4300	35601-36350
	48-B3	6	5000	13051-13650
	66-A3	6	6000	67050-67150
	38-C4	6	4300	36601-37605
	48-B4	6	5000	13901-14900
	66-A4	6	6000	67201-67405
1917	38-C4	6	4300	37701-38701
	48-B4	6	5000	15001-16000
	66-A4	6	6000	67499-67800
1918	48-B4	6	5000	16001-16400
	48-B5	6	6500	16401-17400
1919	48 H. P.	6	7750	511001-511375 512001-512375 513001-513300
	38 H. P.	6	7250	311001-311375 312001-312375
1920	38	6	7250	313001 to 313500
	38	6	....	314001 to 314500
	48	6	7750	514001 to 514500
	48	6	....	515001 to 515700

Number on left of body below front door.

PIEDMONT

Year	Model	Cyls.	Price	Serial Numbers
1917	4-30	4	$1095	1-400
	6-40	6	1545	400-500
1918	4-30	4	1095	500-1000
	6-40	6	1545	1000-1200
1919	4-30	4	1235	1200-2500
	6-40	6	1685	2500-3000

After Dec. 15, 1919, number on main floor board.

1920	4-30	4	1395	1800 to 3000
	6-40	6	1695	

Number on dash.

PORTER—(Previous to 1919, see F. R. P.)

Year	Model	Cyls.	Price	Serial Numbers
1919-20	46	4	$6750	110 to 519

Number on right hand front spring.

PREMIER

Year	Model	Cyls.	Price	Serial Numbers
1912	4-40	4	$3700	5000-7000
	6-60	6	4100	
1913	6-40	6	3900	7000-9000
	6-60	6	4200	
1913½	6-48	6	3700	10000-10499
	6-49	6	3800–3900	10500-11999
1914	A	6	3900	12000-13000
1915	6-50	6	3700–3900	65150-1615000
1916	6-51	6	3900	
1917	6B	6	3200–3400	0001-2912
1918	6C	6	3200–3710	
1919	6C	6	3200–3400–3710	3501-4511
1920	6D	6	4600	5011 and up

1912 to 1916 inclusive, number left frame member, center and near step hanger.
1917 to 1919 inclusive, number under front cushion on left side, on right starting crank on front cross member, and on front spring hanger.

RANGER

Year	Model	Cyls.	Price	Serial Numbers
1920	A-20	4	....	1001 to 13000

REVERE

Year	Model	Cyls.	Price	Serial Numbers
1920	C-D	4	$4250	

Numbers continued through from 1917 when starting number was 501.

REGAL

Year	Model	Cyls.	Price	Serial Numbers
1912	N	4	$ 900	2201-5100
	L	4	1000	2101-3000
	H	4	1400	301-450
1913	T	4	950	5101-7700
	C	4	1250	1-450
	H	4	1400	451-600
1914	T	4	1125	7701-9000
	C	4	1350	453-600
1915	D	4	1085	10171-11254
1916	E	4	650	3074-3525
	D	4	985	11255-11550
	F-8	8	1200	244-550
1917	J	4	695	24382 up

Discontinued.
Number on left hand frame member at spring.

REO

Year	Model	Cyls.	Price	Serial Numbers
1912	R-5, ST-5	4	$1055	36001-42000
1913	R-5, ST	4	1095	42001-52000
1914	R-5, S-5, D	4	1175	52001-64000
1915	R-5, S-5, L	4	1050	64001-76000
	M	6	1385	101-2100
1916	R-5, S-5	4	875	76001-96000
	M, N	6	1250	2101-10200
1917	R-5, S-5	4	875	96001 up
	M, N	6	1150	10201 up
1918	M	6	1385	20100 up
1920	T-6 Touring	6	1750	
	T-6 Sedan	6	2750	24301 and up
	U-6 Roadster	6	1750	
	U-6 Coupe	6	2750	

Number on heel board.

R. & V. KNIGHT

Year	Model	Cyls.	Price	Serial Numbers
1920	J	6	$3150	20000 and up
	R	4	2150	50000 and up

Number on plate on dash.

SAYERS

Year	Model	Cyls.	Price	Serial Numbers
1918	P	6	$1695	5100-5300
1919	A-P B-P	6	1745	5301-5700
1920	C-P	6	2095	5701 to 6000
	D-P	6	2195	6001 to 6600

Number on cowl under hood.

Motor Age Passenger Car Serial Numbers

ROAMER

Year	Model	Cyls.	Price	Serial Numbers
1916	All	..	....	10500-13500
1917	All	6	....	13501-15750
1918	All	4 & 6	....	13751-16970
1919	All	6	....	16971 up
1920		..	....	

Manufacturers of this car state that it is impossible to give consecutive serial numbers because they mix the numbers up as the cars are made. Number on dash board.

ROSS

Year	Model	Cyls.	Price	Serial Numbers
1916	A	8	$1350	1003-1495
1917	C	8	1550	1496-1721

Discontinued.

ROCK FALLS

Year	Model	Cyls.	Price	Serial Numbers
1920	12	6	....	12001 and up

Number over motor's manufacturing plate.

SAXON

Year	Model	Cyls.	Price	Serial Numbers
1915	A	4	$ 395	100-9740
	A-2	4	395	101-519
	B	4	395	10102-15082
	B-2	4	395	342-735
	S	6	785	101-4843
1915-16	14	4	395	101-9574
	S-2	6	835	5101-19199
	S-2-R	6	835	101-2100
1917	B-5-R	4	495	9601-X20543
	B-6-R	4	495	X1-X128
	B-7-R	4	495	X790-X1222
1917-18	S-4-T	6	1045	19201-X40602
	S-4-R	6	995	2101-X5192
	S-4-S	6	1350	30700-X42973
1918	Y-18-R	6	1195	101
	Y-18-T	6	1195	1201
1919	Y-18-T	6	1295	7650 up
	Y-18-R	6	1295	1031 up
1920	125	6	1195	90001 and up

Number on top of the left hand frame side bar next to radiator.

SCRIPPS-BOOTH

Year	Model	Cyls.	Price	Serial Numbers
1915	C	4	$775	101-3100
1916	C	4	825	3101-7260
	D	8	1175	101-800
1917	C	4	935	7261-8146
	D	8	1285	801-1807
	G	4	935	6-800
1918	G	4	1065	801-1800
	H	8	1285	2-325

Number plate on heel board, right hand seat

	6-39	6	1295	9001-11599
	6-40	6	1295	9002-11599
	6-41	6	1985	11432-11599
	6-42	6	1985	11434-11599

Number plate on seat board under front seat cushion

1919	G	4	1065	1801-3000
	6-39	6	1295	11600

Number plate on right seat heel board

	6-40	6	1295	11600-18759
	6-41	6	1985	11600-12432
	6-42	6	1985	11600-16419
	A-41	6	2175	16420 up
	A-42	6	1995	18410 up
1920	B-39	6	1425	
	B-40	6	1425	
	B-41	6	2175	20250-29360
	B-42	6	2295	

Serial numbers under cushion of front seat

SENECA

Year	Model	Cyls.	Price	Serial Numbers
1917	A	4	$735-850	500-1000
1918	D	4	....	1000-2000
1919	H			
1920	L	4	1185	
	O	4	....	2001 up
	M	4	....	

Number plate on 1917 models on dash under hood. On 1918 and 1919 models on dash under hood and on left frame rail in front of radiator

STANDARD

Year	Model	Cyls.	Price	Serial Numbers
1916	E	8	$1850	175-519
			2100	
1917	F	8	2450	C100-599
1918	G	8	2750	600-1099
1919	H	8	2750	1100-1599
1920	I	8	3400	1600-3605

Number plate on dash; engine numbers on crankcase

SKELTON

Year	Model	Cyls.	Price	Serial Numbers
1920	35	4	$1245	500 up
	35	4	1295	500 up

SINGER

Year	Model	Cyls.	Price	Serial Numbers
1915	....	6	....	751-760
				7500-7600
1916	....	6	....	7601-7784
1917	....	6	....	7785-7795
				77100-77902
1918	....	6	....	77903-77904
				18905-18999
1919	....	6	....	19000-19940
1920	....	12	....	20101 up

Number on front spring front horn bracket

STANLEY

Year	Model	Cyls.	Price	Serial Numbers
1915	720 & 721	2	$1975	15001-15999
1916	725, 726, 727, 728	2	2200	16001-16999
1917	728 & 730	2	2200	17001-17999
1918	735 & 736	2	2800-3740	18001-18999
1920	735	2	4275	19001-19999
	735-A	2	4275	
	735-B	2	4275	19424-20251
	735-C	2	5975	
	735-D	2	5775	

Number on name plate on chassis frame

STEARNS-KNIGHT

Year	Model	Cyls.	Price	Serial Numbers
1912	40	4	$3500	5000-5875
1913	28-9	4	3750	6000-6412
	42-8	6	4850	8000-8327
1914	Four	4	3750	6500-6800
	Six	6	4850	8328-8728
1915	L-4	4	1750	L1-L702
	Six	6	5000	9000-9109
1916	Four	4	1395	L703-L2800
	Eight	8	2050	10000-10900
1917	32	4	1450	L2801-L4800
	33	8	2150	10901-12000
1918	4	4	1785	4745-5900
	8	8	2575	12079-12350
1919	L-4	4	2250	L5901-L7102
	8	8	2700	12351-12404
1920	S-K-L-4	4	2350	L-7103 up

Number on first floor board near right side

STEPHENS

Year	Model	Cyls.	Price	Serial Numbers
1916	65	6	$1125	101-1100
1917	65	6	1250	
	75	6	1385	10001-13000
1918	80	6	2050	
1919	82 & 84	6	1975	
	83 & 85	6	3050	15001-20000
	86	6	2050	
1920	80	6	2050	

Number plate on dash, right side, under hood

STUDEBAKER

Year	Model	Cyls.	Price	Serial Numbers
1913	SA	4	$ 885	301501-315611
	AA	4	1290	101501-110614
	E	6	1550	600001-603002
1914	SC	4	1050	403001-420515
	EB	6	1575	605001-612450
1915	SD	4	985	423001-447419
	EC	6	1385	500001-617155
1916	SF	4	885	460001-474180
	ED	6	1050	630001-637260
1917	SF	4	940	474181-500369
				100000-109500
	ED	6	1180	637261-655270
				200000-207500
	SF	4	845	109501-133051
	ED	6	1050	207501-233495
1918	SH	4	895	133101 up
	EG	6	1695	290001 up
	EH	6	1295	233501 up
1919	SH	4	1225	133101-141951
	EG	6	1985	290001-390635
	EH	6	1585	233501-257389
1920	EH	6	1785	257465 to 290000
	EG-6	6	2150	315701 and up
	EH-6	6	....	504501 and up
	EJ-6	6	1485	1000001 and up

1913 numbers on front seat heel board.
1914-15 numbers on front door pocket.
1916-17 numbers inside dash.
1918-19 numbers under left front fender on frame.
1920 numbers on brass plate on rear motor support.

TEMPLAR

Year	Model	Cyls.	Price	Serial Numbers
1918	A-445	4	$2185	1-150
1919	A-445	4	2485	150 up
1920	A-445	4	2685	1200 to 2500

Number plate on dash and right front motor support arm.

TULSA

Year	Model	Cyls.	Price	Serial Numbers
1917	D	4	$1150	3000-3400
1918	D	4	1200	3000-3400
1919	D	4	1200	3000-3500
1920	E	4	1335	4000 up

Number on outside front end left hand side rail of frame.

STUTZ

Year	Model	Cyls.	Price	Serial Numbers
1912	A	4	$2000	Series A
1913	4-B	4	2050	Series B
	6-B	6	2300	
1914	4-E	4	2150	Series E

(Also 300 Speedsters Series S, built in 1917. Year is indicated by Series letter.)

	6-E	6	2400	
1915	HCS	4	1475	Series F
	4-F	4	2275	
	6-F	6	2525	
1916	4-C	4	2300	Series C
1917	4-R	4	2550	Series R
1918	4-S	4	2750	Series S
1919	Data not available.			
1920	H	4	3100	5001 to 9002

Number on left side of dash.

VELIE

Year	Model	Cyls.	Price	Serial Numbers
1912	L-M-N	4	$2200	14001-15999
	W	4	1350	25000-25500
1913	S-T	4	2000	16000-16725
	R	4	1500	30000—(See 5)
1914	5	4	1500	(See R)—31326
	9	4	2000	17301—(See 12)
	10	6	2350	17001-17300
1915	11	4	1500	32101-32500
	12	4	1750	(See 9)—19251
	14	6	2015	19301-19451
	15	6	1595	19500-20090
1916	22	6	1065	35000-39000
1917	27	6	1600	40000—(See 39)
	28	6	1185	50000—(See 38)
1918	38	6	1440	(See 28)—68506
	39	6	1695	(See 27)—40987
1919	38	6	1685	
	39	..	....	
	48	6	....	69001 up
1920	48	6	1985	70001 and up
	34	6	1585	110001 and up

Number on name plate left side seat box. Also stamped into top side of frame at extreme right front end; engine number left side crankcase and left hand front motor leg.

WASP

Year	Model	Cyls.	Price	Serial Numbers
1920	201	4	....	2011 and up

Number on instrument board.

WESTCOTT

Year	Model	Cyls.	Price	Serial Numbers
1912	KLM	4	$1800	
	R	4	2250	
1913	4-40	4	1975	
	6-50	6	2475	
1914	30	4	1385	800-1102
	6-60	6	2485	
1915	O-35	4	1185	1103-1348
	U-50	6	1585	1500-1699
1916	41	6	1295	4001-4200
	42	6	1445	4201-5100
	51	6	1595	4599-5402
1917	17	6	1590	5501-6292

Number on dash plate.

1918	S-18	6	1890	6293-7200
	18-A	6	2290	7201-8088
1919	A-48	6	2590	8101-8904
	A-38	6	1775	10001-10402
	B-38	6	2390	11001-11801
1920	C-38	6	2390	13001 up
	C-48	6	2890	20001 up

Number plate on right side of engine on all cars after S-18.

WILLYS-KNIGHT

Year	Model	Cyls.	Price	Serial Numbers
1917	88-6	6	....	1-2500
1917-18-19	88-4	4	....	1 up
	88-8	8	....	1-2723
1920	88-4	4	$1725	

Number plate on right rear frame end; engine number of models 88-6 and 88-4 on plate on left side crankcase.

WILLY-SIX

Year	Model	Cyls.	Price	Serial Numbers
1917-18-19	89	6	....	1-12000

Number plate on right rear frame end.

WINTON SIX

Year	Model	Cyls	Price	Serial Numbers
1920	25	6	$4250	35675 to 35707
	25	6	....	155 to 2675

Number on left front leg of motor.

WINTHER

Year	Model	Cyls.	Price	Serial Numbers
1920	61	6	....	61001 and up

Number on left side front motor support cross bar.

Buyers' Guide *to* 1922 Cars

MOTOR AGE Presents on the Following Pages the Price, Number of Cylinders, the S. A. E. Horsepower Rating, Wheelbase and Tire Size of the Various Models of Motor Cars Made by the American Manufacturers. The Cars Are Grouped According to Body Styles and the Prices Given Are Those Prevailing Up to the Time of Printing This Issue. Complete Specifications of the Cars, as to Their Mechanical Units Are Printed in the Section Following the Buyers' Guide.

Five Passenger Touring Cars

Name and Model	Prices	Cyl.	H. P.	W. B.	Tires
American—C	2195	6	25.4	127	32 x 4
Anderson—Series-40-C	1650	6	25.4	120	33 x 4
Auburn—6-51-H	1575	6	25.4	121	32 x 4
Beggs Six—20-T	1520	6	25.4	120	33 x 4
Brewster—02	6000	4	25.6	125	32 x 4½
Buick Six—22-45	1395	6	27.3	118	33 x 4
Buick Four—22-35	935	4	18.2	109	31 x 4
Case—X	1890	6	25.4	122	32 x 4½
Chalmers—35-C	1295	6	25.4	117	32 x 4
Champion Tourist	995	4	19.6	113	32 x 3½
Champion Special	1095	4	19.6	118	32 x 4
Chevrolet—490	525	4	21.0	102	30 x 3½
Cleveland—40	1195	6	21.6	112	32 x 4
Climber—S	2250	6	25.3	126	32 x 4½
Columbia Six—C. C	1475	6	25.4	115	32 x 4
Columbia Six Challenger	1195	6	25.4	115	32 x 4
Comet—6-C-53-2	2350	6	29.4	125	33 x 4½
Crow-Elkhart—S-65	1345	6	25.4	117	33 x 4
Crow-Elkhart—L-55	1095	4	19.6	117	33 x 4
Crawford—22-6-40	2750	6	29.4	122½	32 x 4
Davis—61	1795	6	25.4	120	32 x 4
Dixie Flyer—H	1195	4	19.6	112	32 x 4
Dodge Brothers	985	4	24.0	114	32 x 4
Dort—19	985	4	19.6	108	31 x 4
Duesenberg Straight Eight	6500	8	26.5	134	33 x 5
Durant—A-22	890	4	24.0	109	31 x 4
Durant—B-22	1650	6	25.4	123	32 x 4½
Earl—40	1185	4	18.9	112	32 x 4
Elcar	1395	6	25.4	117	33 x 4
Elcar	1095	4	19.6	117	33 x 4
Elgin—K-1	1295	6	23.4	118	33 x 4
Essex	1095	4	18.2	108½	32 x 4
Falcon Six—C-T-22	1595	6	23.4	115	32 x 4
Falcon Six—V. T.-22	1695	6	23.4	115	32 x 4
Falcon Six—M. T.-22	1795	6	23.4	115	32 x 4
Falcon Light Four—C. T. 22	1295	4	15.6	115	32 x 4
Falcon Light Four V. T. 22	1395	4	15.6	115	32 x 4
Falcon Light Four—M.T.22	1495	4	15.6	115	32 x 4
Ford—T	348	4	22.5	100	30 x 3½
Franklin—9-B	2350	6	25.4	115	32 x 4
Gardner—T	895	4	19.6	112	32 x 3½
Goodspeed	....	4	22.5	124	32 x 4½
Grant Standard	1385	6	23.4	116	32 x 4
Hanson—60-T	1595	4	25.4	121	32 x 4
Hatfield—A-42	1345	4	19.6	115	32 x 4
Haynes—55	1595	6	29.4	121	33 x 4
Hudson Super Six	1695*	6	29.4	126	32 x 4
Hupmobile—R	1250	4	16.9	112	32 x 4
Jordan-Silhouette	2095	6	26.4	120	32 x 4
Jackson	1635	6	25.4	121	32 x 4½
King 8	2125*	8	28.8	120	32 x 4½
Kessler—K	2675	4	22.5	117	32 x 4
Kline—6-55-K	1890	6	25.4	121	33 x 4

Five Passenger Touring Cars (continued)

Name and Model	Prices	Cyl.	H. P.	W. B.	Tires
Kurtz Automatic—A	2050	6	25.4	122	32 x 4
Lexington—ST-22	1985	6	25.4	122	32 x 4
Liberty—D	1295	6	29.4	117	31 x 4
Lincoln	4300	8	36.5	130	33 x 5
Maibohm—B	1395	6	23.4	116	32 x 4
Maxwell	885	4	21.0	109	31 x 4
Marmon	3700	6	33.8	136	32 x 4½
Mitchell—F-50	1490	6	29.4	120	33 x 4
Monroe—S-9	1295	4	16.9	115	32 x 3½
Monroe—S-9	1295	4	16.9	115	32 x 3½
Moon—6-48	1785	6	25.3	122	32 x 4
Nash—6	1390	6	25.3	121	33 x 4
Nash Four	1045	4	18.2	112	33 x 4
Norwalk—4-30KS	1035	4	19.6	116	32 x 3½
Oakland—6-44	1145	6	19.8	115	32 x 4
Ogren Six	4250	6	29.4	134	33 x 5
Oldsmobile—43-A	1145	4	21.8	115	32 x 4
Oldsmobile—47	1595	8	26.4	115	32 x 4
Overland Four	595	4	18.2	100	30 x 3½
Packard Single Six	2350	6	27.3	116	33 x 4½
Packard Twin Six	4850	12	43.2	136	35 x 5
Paige	1465	6	25.3	119	32 x 4
Pan-American—6-55E	2000	6	25.3	121	33 x 4
Paterson—22-6-52	1550	6	33.8	120	32 x 4½
Peerless 56—Series-7	2880*	8	45.0	125	34 x 4½
Piedmont—4-30	970	4	19.6	116	32 x 3½
Piedmont—6-40	1285	6	33.8	122	32 x 4
Pilot—6-50	2285	6	25.3	126	32 x 4½
Porter—46	6750	4	36.8	142	35 x 5
Premocar—6-40-A	1295	6	23.4	117	32 x 4
R. & V. Knight—R	1850	4	18.2	116	32 x 4
Re Vere	3200	4	28.9	131	32 x 4½
Rickenbacker	1485	6	23.4	117	32 x 4½
Romer	1975	6	25.3	120	32 x 4
Saxon—125-G	1195	4	19.6	112	32 x 4
Saxon—125-G	1195	4	19.6	112	32 x 4
Sayers Six (Avondale)	1695	6	25.3	119	33 x 4
Seneca—50	945	4	15.6	112	31 x 4
Stanwood—A-22	1765	6	25.3	118	32 x 4½
Stearns Knight—SKL4	2250	4	22.5	125	34 x 4½
Studebaker Light Six	1045	6	23.4	112	32 x 4
Studebaker Special Six	1475	6	29.4	119	32 x 4
Templar—445	1985	4	18.2	118	32 x 4
Tulsa—E1	1175	4	19.6	117	33 x 4
Tulsa—F1	1585	6	25.3	119	33 x 4
Velie—58	1395	6	23.4	115	32 x 4
Vogue—6-55	1885	6	25.3	124	32 x 4
Vogue—6-66	2085	6	29.4	124	33 x 4½
Westcott—A-44	1890	6	25.3	120	32 x 4
Westcott—A-44	1890	6	25.3	120	32 x 4
Westcott—A-44 Special	1890	6	25.3	120	32 x 4
Wills-Sainte-Claire—A68	2875	8	33.8	121	32 x 4½
Willys-Knight—20	1525	4	21.0	118	33 x 4

*Four Passenger.

Buyers' Guide to 1922 Cars—*continued*

Seven Passenger Touring Cars

Name and Model	Prices	Cyl.	H. P.	W. B.	Tires
Ambassador—R	4500	6	31.5	136	33 x 5
American—C	2250*	6	25.4	127	32 x 4
Anderson Series—40-A	1795	6	25.4	120	33 x 4
Apperson—8-22-A	2645	8	33.8	130	34 x 4½
Apperson—8-22-S	....	8	33.8	130	34 x 4½
Buick Six—22-49	1585	6	27.3	124	33 x 4½
Cadillac—61	3150	8	33.8	132	33 x 5
Chalmers—35-C	1395	6	25.4	122	32 x 4
Chandler	1695	6	29.4	123	33 x 4
Cole—870	2485	8	39.2	127	33 x 5
Comet—6-C-53-2	2450	6	29.4	125	33 x 4½
Crawford—22-6-40	2750	6	29.4	122½	32 x 4
Daniels—8-D-19	5350	8	39.2	132	33 x 5
Dorris—6-80	4785	6	38.4	132	33 x 5
Handley-Knight—B	2650	4	27.2	125	32 x 4½
Hanson—60P	1795	4	25.4	121	33 x 4½
Haynes—48	3635	12	36.3	132	34 x 4½
Haynes—75	2395	6	29.4	132	34 x 4½
Holmes—Series 4	2950	6	29.4	126	34 x 4½
Holmers—Series 4(Cali. Sedan)	3850	6	29.4	126	34 x 4½
Hudson Super Six	1745	6	29.4	126	34 x 4½
Jordan Silhouette—7	2475	6	29.4	127	32 x 4½
King—K	2125	8	28.8	120	32 x 4½
Kissel Custom Built Six	2175	6	26.4	124	32 x 4½
La Fayette—A	4090	8	33.8	132	33 x 5
Leach—999	6500	6	33.8	134	32 x 4½
Lexington—T-22	2785	6	25.4	128	32 x 4½
Lincoln	4300	8	36.4	130	33 x 5
Locomobile—48-7	7600	6	48.6	142	35 x 5
Marmon—34	3700	6	33.7	136	32 x 4½
McFarlan—T.V.147	6300	6	48.6	140	33 x 5
Mercer—5	3950†	4	22.5	132	32 x 4½
Mitchell—F-50	1795	6	29.4	127	33 x 4
Moon—6-75	2285	6	29.4	135	32 x 4½
Murray-Mac—70T	4250	6	29.4	131	35 x 5
Nash—6	1540	6	25.3	127	.....
National—Series-BB	2990	7	29.4	130	32 x 4½
Ogren-Six	4375	6	29.4	134	33 x 5
Oldsmobile—46-Thorobred	1735	8	26.4	122	33 x 4½
Packard Twin Six	$4850	12	43.2	136	35 x 5
Pan American—6-55-H	2100	6	25.4	121	33 x 4
Paterson—22-6-52	1585	6	33.8	120	32 x 4½
Peerless—56 Series-7	2880	8	45.0	125	34 x 4½
Pierce Arrow—33	6500	6	38.4	138	33 x 5
Pilot—6-50	2375	6	16.9	126	32 x 4½
Porter—46	6750	4	36.8	142	35 x 5
Premier—6-D	3250	6	27.3	126¾	32 x 4½
Reo—T-6-B	1595	6	17.5	120	33 x 4
Roamer—6-54E	2750	6	29.4	128	32 x 4½
Romer—H	2050	6	25.4	120	32 x 4
Standard 8—11	2500	8	33.8	127	34 x 4½
Stearns-Knight—SKL-4	2450	4	22.5	125	34 x 4½
Stevens Duryea—E	6800	6	48.7	138	35 x 5
Studebaker Big Six	1785	6	36.0	126	33 x 4½
Winton Six—25	4600	6	33.8	132	35 x 5

*Four Passenger. 3150
†Six Passenger. 1450

Roadsters

American—C	$2195	6	25.4	127	32 x 4
Anderson—Series-40	2195	6	25.4	120	33 x 4
Auburn—6-51-R	1575	6	25.4	121	32 x 4
Biddle—B-1-B-5	3475	4	22.5	121	32 x 4
Brewster—02	6000	4	25.6	125	32 x 4½
Buick Four—22-34	895	4	18.2	109	31 x 4
Buick Six—22-44	1360	6	27.3	118	33 x 4
Cadillac—61	3100	8	31.3	132	33 x 5
Chalmers—35-C	1245	6	25.4	117	32 x 4
*Champion Special	1095*	4	19.6	118	32 x 4
Chandler Six	1595	6	29.4	123	33 x 4
Chevrolet—490	525	4	21.0	102	30 x 3½
Cleveland—40	975	6	21.6	112	32 x 4
Climber—S	2250	6	25.4	126	32 x 4½
Climber—K	1385	4	19.6	117	33 x 4
Cole—871	2485	8	39.2	127	33 x 5

Roadsters (continued)

Name and Model	Prices	Cyl.	H. P.	W. B.	Tires
Columbia Six—E.E	1475	6	25.4	115	32 x 4
Crow-Elkhart—S-63	1345	6	25.4	117	33 x 4
Crow-Elkhart—L-53	1095	4	19.6	117	33 x 4
Crawford—22-6-40	2750	6	29.4	122½	32 x 4
Daniels—8-D-19	5350	8	39.2	132	33 x 5
*Davis	1895*	6	25.4	120	32 x 4
Dixie Flyer—H	1195	4	19.6	112	32 x 4
Dixie Flyer—H	1195	4	19.6	112	32 x 4
Dodge Brothers	935	4	24.0	114	32 x 4
Dort—14	985	4	19.6	108	31 x 4
Driggs—1922	1275	4	11.0	104	30 x 3½
Duesenberg Straight 8	6500	8	26.5	134	33 x 5
Du Pont—A	3000	4	39.0	124	32 x 4½
Durant—B-22	1600	6	25.4	123	32 x 4½
Earl—40	1485	4	18.9	112	32 x 4
Elgin—K-1	1345	6	23.4	118	33 x 4
Elcar—R	$1395	6	25.4	117	33 x 4
*Elcar—K	1095	4	19.6	117	33 x 4
Essex	1095	4	18.2	108½	33 x 4
Falcon—R-22	1595	6	23.4	115	32 x 4
Falcon Light Four—R-22	1295	4	15.6	115	32 x 4
Falcon H.P.M-12-D-22-AR	2800	4	12.1	100	27 x3½
Ferris—R-70	2895	6	31.5	130	32 x 4½
Ferris—R-60	2575	6	29.4	130	32 x 4½
Ford—T	319	4	22.5	100	30 x 3½
Franklin—9B	2300	6	25.4	115	32 x 4
Gardner—R	895	4	19.6	112	32 x 3½
Goodspeed	....	4	22.5	124	32 x 4½
Grant	1385	6	23.4	116	32 x 4
Grant Standard	1385	6	23.4	116	32 x 4
H. C. S.—Series 3	2725	4	21.0	120	32 x 4½
Hanson—60R	1595	4	25.4	121	32 x 4
Haynes—55	1645	6	29.4	121	33 x 4
Haynes—48	4200	12	36.3	132	34 x 4½
Haynes—75	2595	6	29.4	132	34 x 4½
Hupmobile—RR	1250	4	16.9	112	32 x 4
Holmes	2950*	6	29.4	126	34 x 4½
Jordan	2095	6	26.4	120	32 x 4
Jackson—638	2285*	6	29.4	126	34 x 4½
King—8	2140	8	28.8	120	32 x 4½
Kissel Custom Built Six	2675	6	26.4	124	32 x 4½
Kline—6-55 Series K	1890	6	25.4	121	33 x 4
La Fayette—F	3985	8	33.8	132	33 x 5
Leach Bitwell—999	6500	6	33.8	134	32 x 4½
Liberty—D	1295	6	29.4	117	31 x 4
Lincoln	4600	8	36.4	130	33 x 5
Maibohm—B	1395	6	23.4	...	.....
Maibohm—B	1395	6	23.4	116	32 x 4
Marmon—34	3700	6	33.8	136	32 x 4½
Maxwell	885	4	21.0	109	31 x 4
McFarlan	6300	6	48.6	140	33 x 5
Mercer—5	3950	4	22.5	132	32 x 4½
Meteor—22-80	5500	4	32.4	129	32 x 4½
Mitchell—F-50	1490	6	29.4	120	33 x 4
Monroe—S-10	1295	4	16.9	115	32 x 3½
Moon—6-48	1785	6	25.4	122	32 x 4
Murray-Mac—70T	4250	6	29.4	131	33 x 5
Nash Six	1360	6	25.4	121	33 x 4
Nash Four	1025	4	18.2	112	33 x 4
National—Series BB	2990	6	29.4	130	32 x 4½
Noma—1D	3000	6	29.4	128	32 x 4½
Noma—3C	2000	6	25.4	128	32 x 4½
Oakland—6-44	1120	6	19.8	115	32 x 4
Oldsmobile—47	1595	8	26.5	115	32 x 4
Oldsmobile—43A	1145	4	21.8	115	32 x 4
Overland—4	595	4	18.2	100	30 x 3½
Packard Twin Six	4850	12	43.2	136	35 x 5
Packard Single Six	2350	6	27.3	116	33 x 4½
Paige Daytona	2245	6	33.8	131	33 x 4½
Paige Lenox	1465	6	25.4	119	32 x 4
Pan-American—6-55F	2000	6	25.4	121	33 x 4
*Peerless—56 Series 7	2880*	8	45.0	125	34 x 4½
Pierce Arrow—33	7000	6	38.4	138	33 x 5
Pilot—650	2285	6	25.4	126	32 x 4½
Porter—46	6750	46	33.2	142	35 x 5

*4 passenger.

Buyers' Guide to 1922 Cars—*continued*

Roadsters (continued)

Name and Model	Prices	Cyl.	H. P.	W. B.	Tires
Premier—6D	3150	6	27.3	126¾	32 x 4½
Premocar—6-40R	1295	6	23.4	117	32 x 4
R. & V. Knight—J	2750	6	29.4	127	32 x 4½
Re Vere	3200	4	28.9	131	32 x 4½
Reo—V6 B	1595	6	17.5	120	33 x 4
Roamer—6-54-E	2850	6	29.4	128	32 x 4½
Romer—F & S	1975	6	25.4	120	32 x 4
Saxon—125G	1195	4	19.6	112	32 x 4
Sayers Six (Derby)	1695	6	25.4	119	33 x 4
Seneca—50	945	4	15.6	112	31 x 4
Standard Eight—11	2500	8	33.8	127	34 x 4½
Stanwood—A-22	1765	6	25.4	118	33 x 4
Stearns Knight—SKL5	2250	4	22.5	125	34 x 4½
Stephens Six—92	1675	6	25.4	122	33 x 4½
Stevens Duryea—E	7250	6	33.5	138	35 x 5
Studebaker Light Six	1045	6	23.4	112	32 x 4
Studebaker Special Six	1425	6	29.4	119	32 x 4
Stutz—K	2950	4	30.6	130	32 x 4½
Templar—445	1985	4	18.2	118	32 x 4
Tulsa—E-2	1175	4	19.6	117	33 x 4
Velie—58	1395	6	23.4	115	32 x 4
Wills Sainte Claire—A-6	2875	8	33.8	121	32 x 4½
Willys Knight—20	1475	4	21.0	118	33 x 4
Winton Six—25	4600	6	33.8	132	35 x 5

*4 passenger.

Sedans

Name and Model	Prices	Cyl.	H. P.	W. B.	Tires
Ambassador R	6500	6	31.5	136	33 x 5
American	3150	6	25.4	127	33 x 4½
Anderson—Series 40-E	2550	6	25.4	120	33 x 4
Apperson—8-22	3695	8	33.8	130	34 x 4½
Auburn—6-51	2395	6	25.4	121	32 x 4
Beggs Six—20T	2420	6	25.4	120	33 x 4
Brewster—02	9200	4	25.6	125	32 x 4½
Buick Six—22-47	2065	6	27.3	118	34 x 4½
Buick Six—22-50	2375	6	27.3	124	34 x 4½
Buick Four—22-37	1395	4	18.2	109	31 x 4
Cadillac—61	4100	8	31.3	132	33 x 5
Case X	2790	6	25.4	122	32 x 4½
Chalmers—35-C	2295	6	25.4	117	32 x 4
Chandler	2395	6	29.4	123	33 x 4
Chevrolet—490	875	4	21.0	102	30 x 3½
Cleveland—40	1595	6	21.6	112	32 x 4
Climber—S	3100	6	25.4	126	32 x 4½
Cole Aero Eight	3685	8	39.2	127	33 x 5
Columbia Six—C. C. S	2350	6	25.4	115	32 x 4
Columbia Six—C. S	1995	6	25.4	115	32 x 4
Comet 6—C-53-2	3650	6	29.4	125	33 x 4½
Crow Elkhart—S-67	2095	6	25.4	117	33 x 4
Crawford—22-6-40	4500	6	29.4	122½	32 x 4
Daniels—8-D 19	6950	8	39.2	132	33 x 5
Davis—66	2595	6	25.4	120	32 x 4
Dixie Flyer—H	1895	4	19.6	112	32 x 4
Dodge Brothers	1785	4	24.0	114	32 x 4
Dorris—6-80	7190	6	38.4	132	33 x 5
Dort—19S	1645	4	19.6	108	31 x 4
Dort—19-T	1195	4	19.6	108	31 x 4
Driggs	1975	4	11.0	104	30 x 3½
Duesenberg Straight Eight	7800	8	26.5	134	33 x 5
Du Pont A	4000	4	31.8	124	32 x 4½
Durant—B-22	2400	6	25.4	123	32 x 4½
Earl—40	1895	4	18.9	112	32 x 4
Elcar	2165	6	25.4	117	33 x 4
Elgin—K-1	2195	6	23.4	118	33 x 4
Essex	1895	4	18.2	108½	32 x 4
Falcon Six—S-22	2395	6	23.4	115	32 x 4
Falcon Light Four—S-22	2085	4	15.6	115	32 x 4
Falcon—4-S	4000	4	12.1	100	27 x 3½
Falcon	4000	4	12.1	100	27 x 3½
Ferris—S-70	3895	6	31.5	130	32 x 4½
Ferris—S-60	3475	6	29.4	130	32 x 4½
Ford T	645	4	22.5	100	30 x 3½
Franklin—9-B	3350	6	25.4	115	32 x 4
Gardner—S	1595	4	19.6	112	32 x 4
Grant	1945	6	23.4	116	33 x 4½

Sedans (continued)

Name and Model	Prices	Cyl.	H. P.	W. B.	Tires
H. C. S. Series-3	3650	4	21.0	120	32 x 4½
Handley Knight B	3750	4	27.2	125	33 x 5
Hanson—60-H	2585	4	25.4	121	33 x 4½
Hatfield—B-42	1950	4	19.6	115	32 x 4
Haynes—55	2595	6	29.4	121	33 x 4
Haynes—48	4950	12	36.3	132	34 x 4½
Haynes—75	3395	6	29.4	132	34 x 4½
Holmes—Series-4	4150	6	29.4	126	34 x 4½
Hudson Super Six	2650	6	29.4	126	34 x 4½
Hupmobile R. I	1935	4	16.9	112	32 x 4
Jordan F	3500	6	29.4	127	32 x 4½
Jordan Sedan	3500	6	26.4	120	32 x 4
Jackson—638	2985	6	25.4	121	32 x 4½
King—8	3235	8	28.8	120	32 x 4½
Kissel Custcm Built Six	3475	6	26.4	124	32 x 4½
Kline—6-55-K	3090	6	25.4	121	33 x 4
La Fayette—E	5175	8	33.8	132	33 x 5
Lexington—SF-22	2285	6	25.4	128	32 x 4½
Lexington—SF-22	3750	6	25.4	122	32 x 4
Liberty—D	2245	6	29.4	117	31 x 4
Lincoln	5400	8	36.5	130	33 x 5
Locomobile—48-7	11000	6	48.6	146	35 x 5
Maibohm—B	2165	6	29.4	116	32 x 4
Marmon—34	5150	6	33.8	136	32 x 5
Maxwell	1485	4	21.0	109	31 x 4
McFarlan—TV-159	7500	6	48.6	140	33 x 5
Mercer—5	5250	4	22.5	132	33 x 5
Mitchell—F-50	2440	6	29.4	120 5p 127 7p	33 x 4 33 x 5
Monroe—S-11	2175	4	16.9	115	33 x 4
Moon—6-48	2785	6	25.4	122	32 x 4
Nash Six	2390	6	25.4	127	33 x 4
Nash Four	1835	4	18.2	112	33 x 4
National—Series BB	4240	6	29.4	130	32 x 4½
Noma—1-D	5500	6	29.4	128	32 x 4½
Noma—3-C	3200	6	25.4	128	32 x 4½
Oakland—6-44	1785	6	19.8	115	32 x 4
Ogren-Six	5500	6	29.4	134	33 x 5
Oldsmobile—47	2295	8	26.5	115	32 x 4
Oldsmobile—43-A	1795	4	21.2	115	32 x 4
Oldsmobile—46	2635	8	26.5	122	33 x 4½
Overland Four	895	4	18.2	100	30 x 3½
Packard Twin Six	6800	12	28.8	136	35 x 5
Packard Single Six	3350	6	27.3	116	33 x 4½
Paige—6-44	2245	6	25.4	119	32 x 4
Paige—6-66	3155	6	33.8	131	33 x 4½
Paterson—22-6-52	2595	6	33.8	120	32 x 4
Peerless—56-7	3790	8	45.0	125	34 x 4½
Peerless—56-7	3790	8	45.0	125	34 x 4½
Pierce Arrow—33	8500	6	38.4	138	33 x 5
Pilot—6-50	3400	6	25.4	126	32 x 4½
Porter—46	7800	4	27.9	142	35 x 5
Premier—6-D	5000	6	27.3	126¾	33 x 5
Premocar—6-40S	1995	6	23.4	117	32 x 4
R. & V. Knight—R	2750	6	22.5	116	32 x 4
R. & V. Knight—J	3450	6	29.4	127	32 x 4½
Reo—T-6-B	2435	6	26.3	120	33 x 4
Revere	4000	4	28.9	131	32 x 4½
Rickenbacker	1985	6	23.4	117	32 x 4
Roamer—6-54-E (5 pass)	3850	6	29.4	128	32 x 4½
Roamer—4-75-E(7 pass)	4650	6	28.9	138	32 x 4½
Romer—R	2700	6	25.4	120	33 x 4½
Saxon—125G	1795	6	19.6	112	32 x 4
Sayers Six (Glendale)	2795	6	25.4	119	33 x 4
Standard 8—11	3500	8	33.8	127	34 x 4½
Stearns Knight—SKL-4	3450	4	22.5	125	34 x 4½
Stevens Salient Six	2650	6	25.4	122	33 x 4½
Stevens Duryea—E	8900	6	30.8	138	35 x 5
Studebaker Light Six	1750	6	23.4	112	32 x 4
Studebaker Special Six	2350	6	29.4	119	32 x 4½
Studebaker Big Six	2700	6	36.0	126	33 x 4½
Templar	2785	4	18.2	118	33 x 4
Velie—58	1995	6	23.4	115	33 x 4½
Vogue—6-55S	2885	6	25.4	124	33 x 4½
Vogue—6-66-S	2985	6	29.4	124	33 x 4½
Westcott—A-44	2890	6	25.4	120	32 x 4
Wills Sainte Claire—A68	4100	8	33.8	121	32 x 4½
Willys Knight—20	2395	4	21.0	118	33 x 4
Winton Six—25	5950	6	33.8	132	35 x 5

Buyers' Guide to 1922 Cars—*continued*

Coupes

Name and Model	Prices	Cyl.	H. P.	W. B.	Tires
Anderson Series—40-B	2450	6	25.4	120	33 x 4
Apperson—8-22	3625	8	33.8	130	34 x 4½
Auburn—6-51	2275	6	25.4	121	32 x 4
Beggs Six—20T	2320	6	25.4	120	33 x 4
Buick-Six—22-46	1885	6	27.3	118	33 x 4
Buick-Six—22-48	2075	6	27.3	124	34 x 4½
Buick Four—22-36	1295	4	18.2	109	31 x 4
Cadillac—61 (Victoria)	3925	8	31.3	132	33 x 5
Cadillac—61	3925	8	31.3	132	33 x 5
Chalmers—35-C	1995	6	25.4	117	32 x 4
Chandler	2295	6	29.4	123	33 x 4
Chevrolet—490	875	4	21.1	102	30 x 3½
Cleveland—40	1550	6	21.6	112	32 x 4
Climber—S	3000	6	25.4	126	32 x 4½
Cole Aero Eight—883	3385	8	39.2	127	33 x 5
Columbia Six—H	1995	6	25.4	115	32 x 4
Columbia Six—H. H	2295	6	25.4	115	32 x 4
Daniels—8-D-19	6250	8	39.2	132	33 x 5
Davis—67	2595	6	25.4	120	32 x 4
Dixie Flyer—H	1895	4	19.6	112	32 x 4
Dodge Brothers	1585	4	24.0	114	32 x 4
Dorris—6-80	5800	6	38.4	132	33 x 5
Dort—14C	1495	4	19.6	108	31 x 4
Dort—14T	1165	4	19.5	108	31 x 4
Duesenberg Straight Eight	7800	8	26.5	134	33 x 4
Du Pont—A	3800	4	31.8	124	32 x 4½
Durant 6—B-22	2250	6	25.4	123	32 x 4½
Elcar—K	2165	6	25.4	117	33 x 4
Elcar—K	1345	4	19.6	117	33 x 4
Elgin—K-1	2195	6	23.4	118	33 x 4
Essex	1345	4	18.2	108½	32 x 4
Falcon Six—C-22	2295	6	23.4	115	32 x 4
Falcon Light 4—C-22	1990	4	15.6	115	32 x 4
Falcon Light 4—C-A-22	....	4	15.6	115	32 x 4
Falcon	1990	4	15.6	115	32 x 4
Falcon	2395	6	23.5	115	32 x 4
Ford—T	580	4	22.5	100	30 x 3½
Franklin—9-B	3200	6	25.4	115	32 x 4
Franklin—9-B (Demi)	3200	6	25.4	115	32 x 4
Grant	1895	6	23.4	116	33 x 4½
H. C. S. Series 3	3450	4	21.0	120	32 x 4½
Handley Knight—B	3750	4	27.2	125	33 x 5
Hanson—60-C	2475	4	25.4	121	33 x 4½
Hatfield—D-42	1950	4	19.6	115	32 x 4
Holmes—Series-4	3850	6	29.4	126	34 x 4½
Hudson Super Six	2570	6	29.4	126	34 x 4½
Hupmobile—RK	1835	4	16.9	112	32 x 4
Jackson	2985	6	25.4	121	32 x 4½
King 8	3125	8	28.8	120	32 x 4½
Kissel Custom Built Six	3275	6	26.4	124	32 x 4½
Kline—6-55K	3050	6	25.4	121	33 x 4
La Fayette—C	5000	8	33.8	132	33 x 5
Liberty—D	2085	6	29.4	117	31 x 4
Lincoln	4950	8	36.5	130	33 x 5
Locomobile—48-7	10500	6	48.6	142	35 x 5
Maibohm—B	2165	6	23.4	116	32 x 4
Marmon—34	4700	6	33.8	136	32 x 4½
Maxwell	1385	4	21.0	109	31 x 4
McFarlan	7500	6	48.6	140	33 x 5
Mercer—5	4850	4	22.5	132	33 x 5
Mitchell—F-50	2290	6	29.4	120	32 x 4
Monroe	2075	4	16.9	115	33 x 4
Moon—6-48	2785	6	25.4	122	32 x 4
Nash Six	2090	6	16.9	127	33 x 4
Nash Four	1645	4	18.2	112	33 x 4
National—Series BB	4140	6	29.4	130	32 x 4½
Oakland—6-44	1685	6	19.0	115	32 x 4
Ogren-Six	5200	6	29.4	134	33 x 5
Oldsmobile—47	2145	8	26.5	115	32 x 4
Oldsmobile—43-A	1645	4	21.8	115	32 x 4
Overland Four	850	4	18.2	100	30 x 3½
Packard Twin Six	6600	12	43.2	136	35 x 5
Packard Single Six	3125	6	27.3	116	33 x 4½
Paige—6-44	1995	6	25.4	119	32 x 4
Paige—6-66	3100	6	33.8	131	33 x 4½
Peerless 56—Series-7	3500	8	45.0	125	34 x 4½
Pierce Arrow—33	8000	6	38.4	138	33 x 5
Pilot—6-50	3350	6	25.4	126	32 x 4½
R. & V. Knight—R	2650	4	22.5	116	32 x 4

(Coupes (continued)

Name and Model	Prices	Cyl.	H. P.	W. B.	Tires
R. & V. Knight—J	3350	6	29.4	127	32 x 4½
Reo—F-6-B	2355	6	26.3	120	33 x 4
Reo—F-6-B	1895	6	26.3	120	33 x 4
Re Vere	3200	4	28.9	131	32 x 4½
Rickenbacker	1885	6	23.4	117	32 x 4
Roamer—6-54E	3850	6	29.4	128	32 x 4½
Roamer—6-54E (Cabriolet)	....	6	....	128	32 x 4½
Romer—J	2400	6	25.4	120	33 x 4½
Saxon—125G	1795	4	19.6	112	32 x 4
Sayers Six (Linwood)	2795	6	25.4	119	33 x 4
Standard Eight—11	3250	8	33.8	127	34 x 4½
Stearns Knight—SKL-4	3150	4	22.5	125	34 x 4½
Studebaker Special Six	2150	6	29.4	119	33 x 4½
Studebaker Big Six	2500	6	36.0	126	33 x 4½
Stutz—K	3990	4	30.6	130	32 x 4½
Templar—445	2785	4	18.2	118	32 x 4
Velie—58	1995	6	23.4	115	33 x 4½
Vogue—6-55C	2785	6	25.4	124	33 x 4½
Vogue—6-66C	2885	6	29.4	124	33 x 4½
Wills Sainte Claire—A-68	3750	6	33.8	121	32 x 4½
Willys-Knight	2195	4	21.0	118	33 x 4
Winton Six—25	5950	6	33.8	132	35 x 5

Limousines

Apperson—8-22	3895	8	33.8	130	34 x 4½
Biddle—B-1-B-5	4800	4	22.5	121	32 x 4
Brewster—02	9200	4	25.6	125	32 x 4½
Cole Aero Eight—894	5750	8	39.2	127	33 x 5
Duesenberg Straight Eight	....	8	26.5	134	33 x 5
Franklin—9-B	3800	6	25.4	115	32 x 4
Hudson Super Six (Touring)	2920	6	29.4	126	34 x 4½
Hudson Super Six	3495	6	29.4	126	34 x 4½
La Fayette—D	5690	8	33.8	132	33 x 5
Lincoln—Suburban	6000	8	36.5	136	33 x 5
Locomobile—48-7	9150	6	48.6	142	35 x 5
Marmon	5300	6	33.7	136	32 x 4½
McFarlan—TV-158	7500	6	48.6	140	33 x 5
Mercer—5	5250	4	22.5	132	33 x 5
Moon	2785	6	....	135	33 x 5
Packard Twin Six	6650	12	43.2	136	35 x 5
Peerless 56—Series 7	....	8	45.0	125	34 x 4½
Pierce Arrow—33	8638	6	38.4	138	33 x 5
Pierce Arrow—33 (French)	8638	6	38.4	138	33 x 5
Stearns Knight—SKL-4	4150	4	22.5	125	34 x 4½
Stevens Duryea—E	8900	6	31.5	138	33 x 5
Cadillac—61	4957	8	31.3	132	33 x 5
Kissel Custom Built Six	3775	6	26.4	124	32 x 4½

Landaulets

Jordan	2900	6	26.4	120	32 x 4
Locomobile	9150	6	48.6	142	35 x 5
Pierce Arrow	8638	6	38.4	138	33 x 5
Stearns Knight—SKL4	4150	4	22.5	125	34 x 4½

Broughams & Town Cars

Ambassador—R	2340	6	31.5	136	33 x 5
Biddle—B-1-B-5	4346	4	22.5	121	32 x 4
Brewster—02	6000	4	25.6	125	32 x 4½
Daniels Town Br	6800	8	39.2	132	33 x 5
Daniels Landaulet Br	7250	8	39.2	132	33 x 5
Elcar—S	....	6	25.4	117	33 x 4
Falcon—TC	....	4	12.1	100	27 x 3½
Falcon	....	4	12.1	100	27 x 3½
Franklin—9-B	....	6	25.4	115	32 x 4
Haynes—48	3095	12	36.3	132	34 x 4½
Haynes—75	3395	6	29.4	132	34 x 4½
Jordan-Silhouette Brougham	3200	6	26.4	120	32 x 4
Lincoln	6000	8	36.5	136	33 x 5
Marmon	5300	.	....	...	.....
McFarlan—TV157	7500	6	48.6	140	33 x 5
Moon—6-48	2785	6	25.4	122	32 x 4
Paterson—22-6-52	2595	6	33.8	120	32 x 4½
Pierce Arrow—33	8379	6	38.4	138	33 x 5
Roamer—6-54E	3950	6	29.4	138	32 x 4½
Stearns Knight—SKL4	4150	4	22.5	125	34 x 4½
Stevens Duryea—E	8900	6	56.9	138	33 x 5
Earl—40	1395	4	18.9	112	32 x 4
Kissel Custom Built Six	3775	6	26.4	124	32 x 4½

Mechanical Specifications of 1922 Passenger Cars

MAKE AND MODEL	ENGINE																						
													LUBRICATION		CARBURETION		IGNITION			ELECTRICAL SYSTEM		
	Wheelbase	Make	Cylinders, Bore and Stroke	Piston Displacement	Engine Suspension	Cylinder Shape	Cylinder Head	Cylinder Cast	Piston Material	Camshaft Drive	Cooling	Cooling Control	System	Type of Pump	Carbureter Make	Fuel Feed	Type	Make	Control	Generator Make	Voltage
Ambassador, R	136	Con...	6-3 5/16x5 3/4	234.8	3	H....	Det...	6	CI....	Chain.....	Pump...	None..	Hol-Crk..	Gear..	Stromb..	Vac...	Cl-Cir...	Bosch..	Hand...	West...	6
American, C	127	H-S...	6-3 1/4x5	248.9	3	L....	Det...	6	CI....	Met-Gear...	Pump...	None..	Cir-Spl..	.....	Stromb..	Vac...	Cl-Cir...	At-K...	Hand...	G&D...	6
Anderson, Series 40	120	Con...	6-3 1/4x4 1/2	224.0	3	L....	Det...	6	CI....	Met-Gear...	Pump...	None..	Hol-Crk..	Gear..	Rayfld..	Vac...	Op-Cir*	Remy..	Hand...	Remy..	6
Apperson, Eight	130	Own..	8-3 1/4x5	331.8	...	T....	Det...	4	CI....	Met-Gear...	Ther....	None..	Hol-Crk..	Gear..	Johnsn..	Vac...	Cl-Cir*	Remy..	Hand...	Bijur...	6
Auburn, Beauty Six, 6-51	121	Con...	6-3 1/4x4 1/2	224.0	3	L....	Det...	6	CI....	Met-Gear...	Pump...	None..	Hol-Crk..	Gear..	Rayfld..	Vac...	OP-Cir..	Remy..	Hand...	Remy..	6
Beggs, 20T	120	Con...	6-3 1/4x4 1/2	224.0	3	L....	Det...	1	CI....	Met-Gear...	Pump...	None..	Hol-Crk..	Gear..	Stromb..	Vac...	.....	Conn...	Hand...	.....	..
Biddle, B-1, B-5	121	Bud...	4-3 3/4x5 1/2	176.7	3	H....	Int...	4	Al....	Met-Gear...	Ther....	None..	Cir-Spl...	Gear..	Zenith...	Vac...	Cl-Cir...	Simms.	Hand...	G&D...	..
	125																				
Brewster, 02	125	Own..	4-4x5 1/2	201.1	4	S....	Det...	4	CI....	Chain.....	Pump...	None..	Hol-Crk..	Gear..	Zenith...	Vac...	.....	Bosch..	Hand...	USL...	12
Buick, Four, 22-34-37	109	Own..	4-3 5/16x4 3/4	170.0	3	H....	Det...	4	CI....	Met-Gear...	Pump...	None..	Cir-Spl...	Gear..	Marvel..	Vac...	S-Pt....	Delco..	Hand...	Delco..	6
Buick, Six, 22-44-47	118	Own..	6-3 5/16x4 1/2	241.6	3	H....	Int...	6	CI....	Non-Met-G..	Pump...	None..	Cir-Spl...	Gear..	Marvel..	Vac...	S-Pt....	Delco..	Hand††	Delco..	6
Buick, Six, 22-48-50	124	Own..	6-3 5/16x4 1/2	241.6	3	H....	Int...	6	CI....	Non-Met-G..	Pump...	None..	Cir-Spl...	Gear..	Marvel..	Vac...	S-Pt....	Delco..	Hand††	Delco..	6
Cadillac, 61	132	Own..	8-3 1/2x5 1/8	314.4	3	L....	Det...	4	CI....	Chain.....	Pump...	Ther...	Hol-Crk..	Gear..	Own....	Pr....	D-Pt....	Delco..	Auto....	Delco..	6
Case, X	122	Con...	6-3 1/4x4 1/2	224.0	3	L....	Det...	6	CI....	Met-Gear...	Pump...	Ther...	Hol-Crk..	Gear..	Rayfld..	Vac...	Cl-Cir*	Delco..	Hand...	Bijur...	6
Chalmers, 35-C	117	Own..	6-3 1/4x4 1/2	224.0	4	L....	Det...	6	Al....	Chain.....	Ther....	None..	Cir-Spl...	Gear..	Stromb..	Vac...	Cl-Cir...	Remy..	Hand...	Aut-L..	6
Chalmers, 35-C	122																				
Champion.....Tourist	113	.....	4-3 1/2x5	192.4	...	L....	.....	4	.....	.....	Ther....	.....	.....	.....	Zenith..	.....	.....	Dynet..	Hand...	Dynet..	..
Champion.....Special	118	.....	4-3 1/2x5	192.4	...	L....	.....	4	.....	.....	Ther....	.....	.....	.....	Zenith..	.....	.....	Dynet..	Hand...	Dynet..	..
Chandler.....Six	123	Own..	6-3 1/2x5	288.6	...	L....	.....	6	.....	Chain.....	Pump...	.....	Cir-Spl...	Pist..	Rayfld..	Vac...	.....	Bosch..	Hand...	Bosch..	6
Chevrolet.....490	102	Own..	4-3 11/16x4	170.9	4	H....	Det...	4	CI....	Met-Gear...	Pump...	None..	Cir-Spl...	Gear..	Zenith...	Gra...	Cl-Cir...	Remy..	Hand...	Aut-L..	6
Chevrolet.....FB	110	Own..	4-3 11/16x5 1/4	224.3	...	L....	.....	4	.....	.....	Pump...	None..	Pressre..	Gear..	Zenith...	Vac...	.....	Remy..	.....	Aut-L..	..
Cleveland.....40	112	Own..	6-3x4 1/2	190.8	4	H....	Det...	6	CI....	Chain.....	Pump...	None..	Cir-Spl...	Gear..	Stromb..	Vac...	Op-Cir*	Bosch..	Hand...	Bosch..	6
Climber.....Four, K	117	H-S...	4-3 1/2x5	192.4	3	H....	Det...	1	CI....	Com-Gear...	Ther....	None..	Cir-Spl...	.....	Stromb..	Vac...	D-pt....	At-K...	Hand...	West...	6
Climber.....Six, S	126	H-S...	6-3 1/4x5	248.9	...	H....	Int...	1	CI....	Met-Gear...	Pump...	None..	Cir-Spl...	.....	Stromb..	Vac...	D-pt....	Bosch..	Hand...	West...	6
Cole.....870	127	Nor...	8-3 1/2x4 1/2	346.3	3	L....	Det...	4	Al....	Com-Gear...	Pump...	Ther...	Cir-Spl...	Gear..	Johnsn..	Vac...	D-pt....	Delco..	Hand...	Deleo..	6
Columbia.....CC	115	Con...	6-3 1/4x4 1/2	224.0	3	L....	Det...	6	CI....	Met-Gear...	Pump...	Ther...	Cir-Spl...	Gear..	Stromb..	Vac...	Cl-Cir*.	At-K...	Hand...	Aut-L..	6
Comet.....6-C53-2	125	Con...	6-3 1/2x5 1/4	303.1	3	H....	Det...	3	.....	Met-Gear...	Pump...	None..	Cir-Spl...	Pist..	Stromb..	Vac...	Op-Cir..	Wagnr.	Hand...	.....	..
Crawford.....22-6-49	122	Con...	6-3 1/2x5 1/4	303.1	...	L....	.....	6	.....	Chain.....	Pump...	.....	Cir-Spl...	.....	Stromb..	Vac...	.....	At-K...	Hand...	West...	6
Crow-Elkhart.....L	117	Lyc...	4-3 1/2x5	192.4	3	L....	Det...	4	CI....	.....	Ther....	None..	Cir-Spl...	Gear..	Zenith...	Vac...	.....	Conn...	Hand...	Dynet..	..
Crow-Elkhart.....S	117	H-S...	6-3 1/4x5	248.9	3	L....	Det...	6	CI....	.....	Pump...	None..	Cir-Spl...	Gear..	Stromb..	Vac...	.....	Conn...	.....	Dynet..	..
Cunningham.....V-4	132	Own..	8-3 3/4x5	441.7	4	L....	Det...	4	Al....	Non-Met-G..	Pump...	Ther...	Hol-Crk..	Gear..	Stromb..	Vac...	D-pt....	Delco..	Hand††	Deleo..	6
Cunningham.....	142	Own..	8-3 3/4x5	441.7	4	L....	Det...	4	Al....	Non-Met-G..	Pump...	Ther...	Hol-Crk..	Gear..	Stromb..	Vac...	D-pt....	Delco..	Hand...	Deleo..	6
Daniels.....D-19	132	Own..	8-3 1/2x5 1/4	404.1	3	L....	Det...	4	CI....	Met-Gear...	Pump...	None..	.....	Gear..	Zenith...	Pr....	D-pt....	.....	Hand††	Deleo..	6
Davis.....61-67	120	Con...	6-3 1/4x4 1/2	224.0	3	L....	Det...	6	CI....	Met-Gear...	Pump...	None..	Hol-Crk..	Gear..	Stromb..	Vac...	.....	Deleo..	Hand...	Deleo..	..
Dixie Flyer.....H	112	H-S	4-3 1/16x5	192.4	3	L....	Det...	4	CI....	Met-Gear...	Ther....	None..	Cir-Spl...	Gear..	Stromb..	Vac...	S-pt....	Eisem..	Hand...	Dynet..	6
Dodge Brothers.....	114	Own..	4-3 7/16x4 1/2	212.3	3	L....	Det...	4	CI....	Met-Gear...	Pump...	None..	Cir-Spl...	Gear..	Stewart..	Vac...	Cl-Cir*.	N.E...	Auto....	N.E....	12
Dorris.....6-80	132	Own..	6-4x5	377.0	4	H....	Det...	3	CI....	Met-Gear...	Pump...	None..	.....	Gear..	Stromb..	Vac...	S-pt....	Bosch..	Hand...	West...	6
Dort.....19	108	D-Ly.	4-3 1/16x5	192.4	3	L....	Det...	4	CI....	Met-Gear...	Ther....	None..	Cir-Spl...	Pist..	Carter..	Vac...	Cl-Cir...	Conn...	Hand...	Bosch..	6
Driggs.....1922	104	Own..	4-2 5/16x4 1/2	109.6	3	L....	Det...	4	CI....	Met-Gear...	Ther....	None..	Cir-Spl...	Gear..	Zenith...	Vac...	Cl-Cir...	Bosch..	Hand...	Bosch..	6
Duesenberg...Straight 8	134	Own..	8-2 7/16x5	259.7	3	H....	Det...	8	Al....	Met-Gear...	Pump...	None..	Hol-Crk..	Gear..	.....	Vac...	Cl-Cir**	Delco..	Hand...	Deleo..	6
Du Pont.....A	124	Own..	4-3 15/16x5 1/2	249.6	...	L....	.....	.....	.....	.....	Pump...	.....	Cir-Spl...	Gear..	Yale&T..	Vac...	S-pt....	Eisem..	Hand...	West...	6
Durant.....A-22	109	Own..	4-3 7/16x4 1/4	200.4	4	H....	Det...	4	CI....	Met-Gear...	Pump...	None..	Cir-Spl...	Gear..	Tillot...	Vac...	Cl-Cir...	Aut-L..	Hand...	Aut-L..	..
Durant.....B-22	123½	Ans...	6-3 1/4x4 1/2	224.0	...	L....	.....	.....	.....	.....	Pump...	.....	.....	.....	.....	Vac...	.....	Aut-L..	.....	.....	..
Earl.....40	112	Own..	4-3 1/16x5 1/4	195.1	4	L....	Det...	4	CI....	Non-Met-G..	Ther....	None..	Cir-Spl...	Pist..	Scoe....	Vac...	S-pt....	Conn...	Hand...	Aut-L..	6
Elcar.....K-4	118	Lyc...	4-3 1/16x5	192.4	3	L....	Det...	4	CI....	Met-Gear...	Ther....	None..	Cir-Spl...	Pist..	Stromb..	Vac...	Op-Cir..	Delco..	Hand...	Delco..	6
Elcar.....7-R	118	Con...	6-3 1/4x4 1/2	224.0	3	L....	Det...	6	CI....	Com-Gear...	Pump...	None..	Pressre..	Gear..	Stromb..	Vac...	Op-Cir..	Delco..	Hand...	Delco..	6
Elgin.....K-1	118	Fall...	6-3 1/16x4 1/4	195.6	3	H....	Det...	6	CI....	Met-Gear...	Ther....	None..	.....	Econ..	Stromb..	Vac...	Cl-Cir...	Wagnr.	Hand...	West...	6
Essex	108½	Own..	4-3 5/16x5	178.9	4	L....	Det...	4	Al....	Met-Gear...	Ther....	Shut...	Cir-Spl...	Pist..	Own....	Vac...	Cl-Cir*.	Bosch..	Hand††	Bosch..	6
Falcon.....Light Four	115	Own..	4-3 1/2x5	192.4	3	L....	Det...	4	CI....	Com-Gear...	Ther....	None..	Hol-Crk..	Gear..	Stromb..	Vac...	Op-Cir..	At-K...	Hand...	West...	6
Falcon.....Six	115	Own..	6-3 1/16x5	230.1	3	L....	Det...	6	CI....	Com-Gear...	Pump...	None..	Cir-Spl...	Econ..	Stromb..	Vac...	Op-Cir..	At-K...	Hand...	West...	6
Falcon.....12-D-22	100	Own..	4-2 3/4x4	95.0	3	L....	Det...	4	Al....	Chain.....	Ther....	None..	Cir-Spl...	Gear..	Zenith...	Vac...	.....	.....	.....	Bosch..	6
Ferris.....60	130	Con...	6-3 1/2x5 1/4	303.1	3	L....	Int...	6	CI....	Non-Met-G..	Pump...	None..	Cir-Spl...	Pist..	Zenith...	Vac...	.....	Split...	Hand...	L. Nev.	6
Ferris.....70	130	Con...	6-3 1/16x5 1/4	234.8	3	L....	Det...	6	CI....	Chain.....	Pump...	None..	Hol-Crk..	Gear..	.....	Vac...	Cl-Cir...	Split...	Hand††	L. Nev.	6
Ford.....T	100	Own..	4-3 3/4x4	176.7	3	L....	Det...	4	CI....	Met-Gear...	Ther....	None..	Cir-Spl...	.....	Own....	Gray..	Op-Cir..	Own...	Hand...	Own....	6
Franklin.....9-B	115	Own..	6-3 1/4x4	199.1	3	H....	Int...	1	Al....	Non-Met-G..	Air.....	None..	Hol-Crk..	Gear..	Own....	Vac...	Cl-Cir*.	At-K...	Auto....	N.E....	12
Frontenac	.....	.....	4-3 5/16x5 1/2	196.8	...	L....	.....	.....	.....	.....	Ther....	.....	.....	.....	.....	.....	.....	Deleo..	.....	.....	..
Gardner.....R.T.S.	112	Lyc...	4-3 1/16x5	192.4	3	L....	Det...	4	CI....	Met-Gear...	Ther....	None..	Cir-Spl...	Pist..	Carter..	Vac...	Cl-Cir**	West...	Hand...	West...	6
Grant	116	Wall...	6-3 1/16x4 1/2	207.1	3	H....	Det...	6	CI....	Non-Met-G..	Ther....	None..	Cir-Spl...	Gear..	Stromb..	Vac...	Cl-Cir...	At-K...	Hand...	Bij.....	6
Goodspeed	124	Own..	4 3 3/4x5 1/2	226.4	3	.....	Det...	4	CI....	Chain.....	Pump...	Ther...	Hol-Crk..	.....	Rayfld..	Pr....	Op-Cir..	Split...	Auto....	West...	6
H. C. S.....Series 3	120	Wei...	4-3 5/16x5 1/2	210.6	4	H....	Det...	4	CI....	Met-Gear...	Pump...	None..	Hol-Crk..	Gear..	Stromb..	Pr....	.....	Delco..	Hand...	Delco..	..
Handley-Knight.....B	125	Kni...	4-4 1/2x4 1/2	227.2	3	S....	Det...	4	Al....	Chain.....	Ther....	None..	Hol-Crk..	Econ..	Tilllot...	Vac...	Cl-Cir...	Aut-L..	Auto....	Auto-L..	..
Hanson.....60	121	Con...	6-3 1/4x4 1/2	224.0	3	L....	Det...	6	CI....	Met-Gear...	Pump...	None..	Hol-Crk..	Gear..	Marvel..	Vac...	.....	Delco..	Hand...	Delco..	6
Hatfield.....A-42	115	H-S...	4-3 1/2x5	192.4	3	L....	Det...	4	CI....	Met-Gear...	Ther....	None..	Cir-Spl...	Gear..	Zenith...	Vac...	Op-Cir*.	Conn...	Hand...	Dynet..	6
Haynes.....75	132	Own..	6-3 1/2x5-3/8	299.0	3	L....	Det...	6	CI....	Chain.....	Pump...	Ther...	Hol-Crk..	Gear..	Stromb..	Vac...	Cl-Cir*.	King...	Hand...	L-Nev.	6
Haynes.....55	121	Own..	6-3 1/2x5...	288.6	3	L....	Int...	6	CI....	Met-Gear...	Pump...	None..	Cir-Spl...	Pist..	Rayfid..	Vac...	Cl-Cir*.	King...	Hand...	L-Nev.	6
Holmes.....Series 4	126	Own..	6-3 1/2x4 1/2	259.8	3	H....	Det...	1	Al....	Non-Met-G..	Air.....	.....	Cir-Spl...	Gear..	Stromb..	Vac...	.....	Eisem..	Auto....	Dynet..	12
Hudson.....Super-Six	126	Own..	6-3 1/2x5	288.6	4	L....	Det...	6	CI....	Met-Gear...	Pump...	Shut...	Cir-Spl...	Pist..	Own....	Vac...	Cl-Cir*.	Bosch..	Hand††	Bosch..	6
Hupmobile.....R	112	Own..	4-3 1/4x5 1/2	182.5	3	L....	Det...	4	CI....	Chain.....	Ther....	None..	Hol-Crk..	Gear..	Stromb..	Vac...	Cl-Cir...	At-K...	Hand...	West...	6
Jackson.....6-38	121	Con...	6-3 1/4x4 1/2	224.0	...	L....	.....	.....	.....	.....	Pump...	.....	Pressre..	Gear..	Stromb..	Vac...	S-pt....	Remy..	Hand...	Aut-L..	6
Jordan.....M. X.	120	Own..	6-3 5/16x4 3/4	245.6	3	L....	Det...	6	CI....	Chain.....	Pump...	None..	Hol-Crk..	Gear..	Stromb..	Vac...	Op-Cir..	Delco..	Hand...	Deleo..	6
Jordan.....F	127	Con...	6-3 1/16x5 1/4	303.1	3	L....	Int...	6	CI....	Non-Met-G..	Pump...	None..	Hol-Crk..	Pist..	Stromb..	Vac...	Op-Cir..	Delco..	Deleo...	Hand..	6
King.....K	120	Own..	8-3x5	282.7	3	L....	Int...	4	CI....	Chain.....	Ther....	None..	Hol-Crk..	Gear..	B&B....	Vac...	Cl-Cir..	At-K...	Auto....	West...	6
Kissel.....45	124	Own..	6-3 5/16x5 1/2	284.4	3	L....	Det...	6	CI....	Non-Met-G..	Pump...	Ther...	Cir-Spl...	Gear..	Stromb..	Vac...	Op-Cir*.	Remy..	Hand††	Remy..	6
Kline Kar.....6-55-K	121	Con...	6-3 1/4x4 1/2	224.0	3	L....	Det...	6	CI....	Met-Gear...	Pump...	None..	Hol-Crk..	Gear..	Rayfid..	Vac...	Cl-Cir**	Conn...	Hand...	Wagnr.	6
Kurtz.....Automatic, A	122	H-S...	6-3 1/4x5	248.9	3	L....	Det...	6	CI....	Com-Gear...	Pump...	None..	.....	Gear..	Zenith...	Vac...	.....	West...	Hand...	West...	..
Lafayette.....134	132	Own..	8-3 1/4x5 1/4	348.4	4	L....	Det...	4	CI....	Chain.....	Pump...	T&S...	Hol-Crk..	Gear..	Johnsn..	Pr....	D-pt....	Delco..	Hand††	Delco..	6

Abbreviation interpretations on page 80.

Mechanical Specifications of 1922 Passenger Cars

Clutch	GEAR-SET		UNIVERSAL JOINTS							TIRES						BRAKES				BEARINGS			
Make	Location	Forward Speeds	Type	Rear Axle Make	Final Drive	Rear Axle Type	Direct Gear Ratio	Torque Taken By	Propulsion Taken By	Front	Rear	Wheels	Rear Springs	Steering Gear Make	Speedometer Make	Service	Emergency	Location	Gearset	Rear Axle	Front Wheels (O)	Front Wheels (I)	MAKE AND MODEL
B-L...	Un W E..	3	Fab...	Tim...	H-B...	F	4.45	TA...	Sp...	32x4½	32x4½	.....	½E..	Jac...	S-W...	Ext...	Int...	R-W..	Roll...	Roll...	R....	R....	Ambassador.....R
B&B..	Un W E..	3	Met...	Sal...	S-B...	F	4.50	Sp...	Sp...	32x4	32x4	.....	½E..	War..	V-S...	Ext...	Int...						American.....C
B&B..	Un W E..	3	Fab...	Sal...	S-B...	¾	4.50	Sp...	Sp...	33x4	33x4	.....	½E..	Gem..	.....	Ext...	Int...	R-W..	Ball..	Ball..	R....	R....	Anderson.....Series 40
Own..	Sep Un...	3	Met...	Own...	S-B...	½	4.25	Sp...	Sp...	34x4½	34x4½	.....	¾E..	Own..	V-S...	Ext...	Int...	R-W..	Roll...	Roll...	R....	R....	Apperson.....Eight
B&B..	Un W E..	3	Met...	Sal...	S-B...	F	5.00	TA...	Sp...	32x4	32x4	Art...	½E..	Jac...	S-W...	Ext...	Int...	.....	Ball..	Ball..	R....	R....	Auburn Beauty Six..6-51
B&B..	Un W E..	3	Met...	S-P....	S-B...	¾	4.75	Sp...	Sp...	33x4	33x4	Dis...	½E..	Dit...	S-W...	Ext...	Int...						Beggs.....20T
War..	Un W E..	4	Met...	S-P....	S-B...	½	4.50	Sp...	Sp...	32x4	32x4	Art...	½E..	Gem..	S-W...	Ext...	Int...	R-W..	Roll...	Roll...	R....	R....	Biddle.....B-1, B-5
Own..	Un T T..	3	Lea...	Own...	S-B...	F	.....	TT..	TT..	32x4½	32x4½	Art...	FC..	Own..	S-W...	Int...	Int...	R-W..					Brewster.....62
Own..	Un W E..	3	Met...	Own...	S-B...	¾	4.66	TT..	TT..	31x4	31x4	Art...	½E..	Jac...	S-W...	Ext...	Int...	R-W..	Roll...	Roll...	B....	B....	Buick Four....22, 34, 37
Own..	Un W E..	3	Met...	Own...	S-B...	¾	4.60	TT..	TT..	33x4	33x4	Art...	FC..	Jac...	S-W...	Ext...	Int...	R-W..	Ball..	Ball..	B....	B....	Buick Six....22, 44, 47
Own..	Un W E..	3	Met...	Own...	S-B...	¾	4.90	TT..	TT..	33x4½	33x4½	Art...	FC..	Jac...	S-W...	Ext...	Int...	R-W..	Ball..	Ball..	B....	B....	Buick Six....33, 48, 50
Own..	Un W E..	3	Met...	Tim...	S-B...	F	.....	TA...	Sp...	33x5	33x5	.....	Pl...	Own..	.....	Ext...	Int...						Cadillac.....61
Own..	Un W E..	3	Fab...	Col...	S-B...	½	4.66	Sp...	Sp...	32x4½	32x4½	Art...	½E..	Jac...	S-W...	Ext...	Int...	R-W..	Roll...	Roll...	R....	R....	Case.....X
Own..	Un W E..	3	Met...	Ad....	S-B...	½	5.12	Sp...	Sp...	32x4	32x4	Art...	½E..	Own..	S-W...	Ext...	Int...	R-W..					(Chalmers.....35-C
																							(Chalmers.....35-C
B&B..	.....	3	.....	Col...	Bev...	F	.....	.....	.....	32x3½	32x1½	Art...	½E..	.....	.....	.....	.....	.....	.....	Roll...	.....	.....	Champion.....Tourist
B&B..	.....	3	.....	Col...	Bev...	F	.....	.....	.....	32x4	32x4	Art...	½E..	.....	.....	.....	.....	.....	.....	.....	R....	R....	Champion.....Special
B&B..	Un W E..	3	.....	Own...	S-B...	F	4.40	Sp...	.....	33x4	33x4	Art...	½E..	CAS..	S-W...	.....	.....	.....	.....	Ball..	Ball..	R....	Chandler.....Six
Own..	Un W E..	3	Met...	Own...	S-B...	½	3.66	TT..	Sp...	30x3	30x3½	Art...	¼E..	Own..	S-W...	.....	Int...	.....	Ball..	Roll..	R....	R....	Chevrolet.....490
.....	.....	3	.....	.....	.....	¾	.....	.....	.....	33x4	33x4	Art...	½E..	.....	.....	.....	.....	.....	.....	Roll..	B....	B....	Chevrolet.....FB
B&B..	Un W E..	3	Met...	Own...	S-B...	½	4.45	Sp...	Sp...	32x4	32x4	.....	½E..	CAS..	V-S...	Ext...	Ext...	R-W..	Roll...	R&B..	R....	R....	Cleveland.....40
B&B..	Un W E..	3	Met...	Ad....	H-B...	F	4.00	Sp...	Sp...	32x4	33x4	.....	½E..	CAS..	S-W...	I&E...	I&E...	R-W..	.....	Roll...	R....	R....	Climber.....4K
Mun..	Un W E..	3	.....	Ad....	H-B...	.....	4.75	Sp...	Sp...	32x4½	32x4½	.....	½E..	CAS..	V-S...	I&E...	I&E...	R-W..	.....	Roll...	R....	R....	Climber Six.....S
Nor...	Un W E..	3	Met...	Col...	S-B...	F	.....	Sp...	Sp...	33x5	33x5	Art...	½E..	Gem..	S-W...	Ext...	Int...	R-W..	Ball..	Roll...	R....	R....	Cole.....870
B&B..	Un W E..	3	Met...	Tim...	S-B...	½	.....	TA...	Sp...	32x4	32x4	.....	Ca...	Gem..	S-W...	Ext...	Int...	R-W..	.....	.....	.....	.....	Columbia.....CC
B&B..	Un W E..	3	Met...	Col...	S-B...	¾	.....	Sp...	Sp...	33x4½	33x4½	Art...	½E..	Gem..	S-W...	Ext...	Int...	R-W..	.....	.....	.....	.....	Comet.....6-C53-2
B-L...	Un W E..	3	.....	Tim...	S-B...	½	.....	Sp...	.....	32x4	32x4	Art...	½E..	Lav..	S-W...	.....	.....	.....	Roll...	Roll...	R....	R....	Crawford.....22-6-49
B&B..	Un W E..	...	Fab...	Per...	S-B...	F	4.25	.....	Sp...	33x4	33x4	Art...	.....	Dit...	S-W...	Ext...	Int...	R-W..	.....	.....	.....	.....	Crow-Elkhart.....L
B&B..	.....	3	Fab...	Per...	S-B...	F	4.25	.....	Sp...	33x4	33x4	Art...	.....	Dit...	S-W...	Ext...	Int...	.....	.....	.....	.....	.....	Crow-Elkhart.....S
Own..	Un W E..	4	Fab...	Tim...	S-B...	F	4.22	TA...	Sp...	33x5	33x5	.....	¾E..	Gem..	Wal...	Ext...	Int...	.....	.....	.....	.....	.....	Cunningham.....V-4
Own..	Un W E..	4	Fab...	Tim...	S-B...	F	4.22	TA...	Sp...	33x5	33x5	.....	¾E..	Gem..	Wal...	Ext...	Int...	.....	.....	.....	.....	.....	Cunningham.....
Own..	Un W E..	...	Met...	Tim...	S-B...	F	.....	TA...	.....	33x5	33x5	.....	½E..	Gem..	Wal...	Ext...	Int...	R-W..	.....	Roll...	R....	R....	Daniels.....D-19
B&B..	Un W E..	3	Met...	Tim...	S-B...	¾	5.99	Sp...	Sp...	32x4	32x4	.....	½E..	War..	S-W...	Ext...	Int...	.....	.....	.....	.....	.....	Davis.....61-67
B&B..	Un W E..	3	Fab...	Per...	S-B...	F	4.75	TT..	TT..	32x4	32x4	Art...	¾E..	CAS..	V-S...	Ext...	Int...	R-W..	Ball..	Roll...	R....	R....	Dixie Flyer.....H
Own..	Un W E..	3	Met...	Own...	S-B...	F	4.16	TT..	Sp...	32x4	32x4	.....	¾E..	Own..	J-M...	Ext...	Int...	R-W..	.....	.....	.....	.....	Dodge Brothers.....
Own..	Un W E..	3	Met...	Tim...	S-B...	¾	.....	Sp...	Sp...	33x5	33x5	Art...	½E..	Ross..	V-S...	Ext...	.....	R-W..	Ball..	Roll...	R....	R....	Dorris.....6-80
Det...	Un W E..	3	Met...	Fli....	S-B...	¾	4.45	TT..	Sp...	31x4	31x4	.....	FC..	Jac...	S-W...	Ext...	Int...	R-W..	Ball..	Roll...	R....	R....	Dort.....19
Hoo...	Un W E..	3	Met...	Own...	S-B...	¾	4.75	TT..	TT..	30x3½	30x3½	Wir...	FC..	CAS..	S-W...	Ext...	Int...	R-W..	.....	.....	.....	.....	Driggs.....1922
Own..	Un W E..	3	Fab...	Own...	S-B...	½	4.60	TT..	.....	33x5	33x5	Wir...	½E..	Ross..	S-W...	Int...	Ext...	.....	.....	.....	.....	.....	Duesenberg, Straight..8
B-L...	Un W E..	4	.....	Col...	S-B...	F	.....	Sp...	.....	32x4½	32x4½	.....	½E..	Jac...	S-W...	.....	I.....	.....	Roll...	Roll...	R....	R....	Du Pont.....A
Own..	Sep Un...	3	.....	Ad....	S-B...	¾	4.30	Sp...	Sp...	31x4	31x4	Art...	½E..	War..	S-W...	Ext...	Int...	R-W..					Durant.....A-22
.....	Sep Un...	3	.....	Tim...	S-B...	½	.....	.....	.....	32x4½	32x4½	Art...	½E..	.....	.....	Ext...	Int...	R-W..	Roll...	Roll...	R....	R....	Durant.....B-22
B&B..	Un W E..	3	Fab...	Own...	S-B...	½	3.66	Sp...	Sp...	32x4	32x4	Art...	½E..	CAS..	S-W...	Ext...	.....	.....	Ball..	Roll...	R....	R....	Earl.....40
B&B..	Un W E..	3	Met...	Sal...	S-B...	¾	4.75	Sp...	Sp...	33x4	33x4	.....	½E..	Fos..	S-W...	Ext...	Int...	R-W..	Ball..	Ball..	R....	R....	Elcar.....K-4
War..	Un W E..	3	Met...	Sal...	S-B...	¾	4.50	Sp...	Sp...	32x4	32x4	.....	½E..	Gem..	S-W...	Ext...	Int...	R-W..	Roll...	Ball..	R....	R....	Elcar.....7-R
B&B..	Un W E..	3	Met...	Col...	S-B...	¾	.....	TA...	Sp...	33x4	33x4	.....	Ca...	CAS..	V-S...	Ext...	Int...	R-W..	Ball..	Ball..	R....	R....	Elgin.....K-1
Own..	Un W E..	3	Met...	Tim...	S-B...	½	4.66	Sp...	Sp...	32x4	32x4	Art...	½E..	Gem..	S-W...	Ext...	Int...	R-W..	Roll...	Roll...	R....	R....	Essex.....
B&B..	Un W E..	3	Met...	Fli....	S-B...	½	4.88	Sp...	Sp...	32x4	32x4	.....	½E..	CAS..	S-W...	Ext...	Int...	.....	.....	.....	.....	.....	Falcon Light.....Four
B&B..	Un W E..	3	Met...	Fli....	S-B...	½	4.88	Sp...	Sp...	32x4	32x4	.....	½E..	CAS..	S-W...	Ext...	Int...	.....	.....	.....	.....	.....	Falcon.....Six
Own..	Sep Un...	3	.....	Own...	S-B...	¾	.....	Sp...	Sp...	27x3½	27x3½	Wir...	½E..	Own..	S-W...	Int...	Int...	.....	.....	.....	.....	.....	Falcon.....12-D-22
.....	Un W E..	...	Met...	Col...	S-B...	¾	.....	TA...	Sp...	32x4½	32x4½	Dis...	½E..	Gem..	S-W...	Ext...	Int...	R-W..	.....	.....	.....	.....	Ferris.....66
.....	Un W E..	...	Met...	Col...	S-B...	¾	.....	TA...	Sp...	32x4½	32x4½	St...	½E..	Gem..	S-W...	Ext...	Int...	R-W..	.....	.....	.....	.....	Ferris.....70
Own..	Un W E..	2	Met...	Own...	StB...	½	3.63	TT..	.....	30x3½	30x3½	Art...	T½..	Own..	.....	.....	.....	.....	.....	Roll...	R....	R....	Ford.....T
B&B..	Sep Un...	3	Met...	Own...	S-B...	½	4.35	Sp...	Sp...	32x4	32x4	Art...	El...	Own..	S-W...	Ext...	Ext...	.....	Ball..	Ball..	B....	B....	Franklin.....9-B
.....	.....	...	.....	Own...	.....	¾	.....	.....	.....	32x4	32x4	.....	½E..	.....	.....	.....	.....	.....	.....	.....	.....	.....	Frontenac.....
B&B..	Un W E..	3	Met...	Fli....	S-B...	¾	4.44	Sp...	Sp...	32x3½	32x3½	Art...	½E..	Dit...	S-W...	Ext...	Int...	R-W..	Ball..	Roll...	R....	R....	Gardner.....R.T.S
B&B..	Un W E..	...	Met...	Col...	S-B...	¾	4.60	Sp...	Sp...	32x4	32x4	Art...	½E..	Jac...	V-S...	Ext...	Int...	R-W..	Ball..	Ball..	R....	R....	Grant.....
G-L...	Un W E..	3	Fab...	Col...	S-B...	..	4.00	TT..	Sp...	32x4½	32x4½	Wir...	FC..	Jon..	Wal...	Ext...	Int...	R-W..	.....	.....	.....	.....	Goodspeed.....
.....	Un W E..	3	Met...	Own...	S-B...	¾	.....	TT..	TT..	32x4½	32x4½	Wir...	½E..	.....	S-W...	Int...	Ext...	R-W..	.....	.....	.....	.....	H.C.S.....Series 3
War..	Un W E..	3	Met...	Tim...	S-B...	½	4.90	Sp...	Sp...	32x4½	32x4½	.....	½E..	Gem..	V-S...	Ext...	Int...	.....	.....	.....	.....	.....	Handley-Knight.....8
B&B..	Un W E..	...	.....	Tim...	S-B...	¾	4.66	Sp...	Sp...	32x4	32x4	.....	½E..	Gem..	S-W...	Ext...	Int...	.....	.....	.....	.....	.....	Hanson.....60
B&B..	Un W E..	3	Met...	Col...	S-B...	¾	4.63	Sp...	Sp...	32x4	32x4	Art...	½E..	Gem..	S-W...	Ext...	Int...	R-W..	.....	.....	.....	.....	Hatfield.....A-42
B&B..	Un W E..	3	Met...	Own...	S-B...	¾	4.60	TA...	Sp...	34x4½	34x4½	Art...	½E..	Jac...	S-W...	Ext...	Int...	R-W..	Ball..	Ball..	R....	R....	Haynes.....75
B&B..	Un E W.	3	Met...	Own...	S-B...	¾	4.11	Sp...	Sp...	33x4	33x4	Art...	½E..	Jac...	S-W...	Int...	Int...	R-W..	Ball..	Ball..	R....	R....	Haynes.....55
B-L...	Un W E..	3	Met...	Tim...	S-B...	½	.....	Sp...	Sp...	34x4½	34x4½	Art...	El...	Gem..	S-W...	Ext...	Int...	.....	B&R..	Roll...	R....	R....	Holmes.....Series 4
Own..	Un W E..	3	Met...	Tim...	S-B...	½	4.81	Sp...	Sp...	34x4½	34x4½	Art...	½E..	Gem..	S-W...	Ext...	Int...	R-W..	Roll...	Roll...	R....	R....	Hudson.....Super-Six
Own..	Un W E..	3	Met...	Own...	S-B...	¾	4.87	Sp...	Sp...	32x4	32x4	Art...	½E..	Jac...	S-W...	Ext...	Int...	R-W..	.....	Roll...	R....	R....	Hupmobile.....R
B&B..	Un W E..	3	.....	Sal...	S-B...	¾	4.75	Sp...	.....	32x4½	32x4½	St...	½E..	Own..	.....	.....	.....	.....	Ball..	Roll...	R....	R....	Jackson.....
Dt....	Un W E..	3	Met...	Tim...	S-B...	½	4.42	Sp...	Sp...	32x4	32x4	.....	½E..	Gem..	S-W...	Ext...	Int...	R-W..	Ball..	Roll...	R....	R....	Jordan.....MX
Dt....	Un W E..	3	Met...	Tim...	StB...	½	4.80	Sp...	Sp...	32x4½	32x4½	.....	½E..	Gem..	S-W...	Ext...	Int...	R-W..	Ball..	Roll...	R....	R....	Jordan.....F
Dt....	Un W E..	3	Fab...	Col...	S-B...	F	.....	TA...	Sp...	32x4½	32x4½	.....	FC..	Jac..	V-S...	Ext...	Int...	.....	Roll...	Roll...	R....	R....	King.....K
War..	Un W E..	3	Met...	.....	S-B...	F	.....	Sp...	Sp...	32x4½	32x4½	Wir...	½E..	Jac..	S-W...	Ext...	Ext...	R-W..	.....	.....	.....	.....	Kissel.....45
B&B..	Un W E..	3	Fab...	S-P....	S-B...	½	4.75	Sp...	Sp...	33x4	33x4	Art...	¾E..	Woh..	S-W...	Ext...	Int...	R-W..	Ball..	Roll...	R....	R....	Kline Kar.....6-55-K
B&B..	Un W E..	3	Fab...	Sal...	S-B...	¾	4.50	Sp...	Sp...	32x4	32x4	Art...	½E..	Gem..	S-W...	Ext...	Int...	R-W..	.....	.....	.....	.....	Kurtz, Automatic.....A
Own..	Un W E..	3	Met...	Own...	S-B...	F	.....	TT..	TT..	33x5	33x5	Art...	½E..	Own..	Wal...	Ext...	Int...	.....	Roll...	Roll...	R....	R....	Lafayette.....134

Mechanical Specifications of 1922 Passenger Cars

MAKE AND MODEL	ENGINE																													
														LUBRICATION		CARBERETION		IGNITION				ELECTRICAL SYSTEM								
	Wheelbase	Make	Cylinders, Bore and Stroke	Piston Displacement	Engine Suspension	Cylinder Shape	Cylinder Head	Cylinder Cast	Piston Material	Camshaft Drive	Cooling	Cooling Control	System	Type of Pump	Carbureter Make	Fuel Feed	Type	Make	Control	Generator Make	Voltage									
Leach 999	134	Own	6-3¾x5¼	347.9	3	H	Det	6	CI		Pump	None	Hol-Crk	Gear	Rayfld	Vac	Op-Cir*	Delco	Hand	Delco										
Lexington T-22	128	Ans	6-3¼x4½	224.0	3	H	Det	6	CI	Non-Met-G	Pump	Ther	Hol-Crk	Gear	Rayfld	Vac	Op-Cir	Conn	Hand	G&D	6									
Lexington ST-22	122	Ans	6-3¼x4½	224.0	3	H	Det	6	CI	Non-Met-G	Pump	Ther	Hol-Crk	Gear	Rayfld	Vac	Op-Cir	Conn	Hand	G&D	6									
Liberty 10-D	117	Own	6-3½x5	230.1	3	L	Det	1	CI	Met-Gear	Ther		Pressre	Gear	Stromb	Vac	Op-Cir	Wagnr	Hand	Wagnr	6									
Lincoln	136	Own	8-3⅜x5	357.8	3	L	Det	4	CI	Chain	Pump	T&S	Hol-Crk	Gear	Stromb	Vac	Cl-Cir	Delco	Hand††	Delco	6									
Locomobile 48	142	Own	6-4½x5½	524.8	4	L	Int	2	CI	Non-Met-G	Pump	None		Gear	B&B	Pr	D-pt	Berlg	Hand	West	6									
Maibohm B	116	Fall	6-3½x4¼	195.6	3	H	Det	6	CI	Met-Gear	Ther	None	Cir-Spl	Pist	Tillot	Vac	Op-Cir*	At-K	Hand	Bijur	6									
Marmon 34	136	Own	6-3¾x5⅛	339.7	4	H	Det	3	CI	Non-Met-G	Pump	None	Hol-Crk	Gear	Stromb	Gra		Delco	Hand††	Delco	6									
Maxwell	109	Own	4-3⅝x4½	185.8			Det	4	Al		Ther	None	Cir-Spl		Eagle	Gra					6									
MacFarlan T. V.	140	Own	6-4½x6	572.5	4	T	Det	3	CI	Met-Gear	Pump	None	Hol-Crk	Gear	Rayfld	Vac		Wes	Hand	West	6									
Mercer Series 5	132	Own	4-3¾x6¾	298.2	4	L	Int	4	CI	Chain	Pump	None		Gear		Vac	S-pt	Eisem	Hand	West	6									
Merit B-C	119	Con	6-3¼x4½	224.0	3	L	Det	6	CI	Met-Gear	Pump	None		Gear	Stromb	Vac	Cl-Cir	Delco	Hand	Delco										
Meteor 22-80	120	Due	4-4¼x6	340.4	3	H	Int	4	Al	Chain	Pump	None	Pressre	Gear	Zenith	Vac	S-pt		Hand	West										
Mitchell F-50	120	Own	6-3½x5	288.6	3	L	Det	6	CI	Met-Gear	Pump	Ther	Cir-Spl	Pist	Stromb	Vac	S-pt	Remy	Hand	Remy	6									
Mitchell F-50	127	Own	6-3½x5	288.6	3	L	Det	6	CI	Met-Gear	Pump	Ther	Cir-Spl	Pist	Stromb	Vac	S-pt	Remy	Hand	Remy	6									
Monroe S-9-10-11-12	115	Own	4-3¼x4½	149.3	3	H	Det	4	Al	Met-Gear	Ther	None	Hol-Crk	Gear	Zenith	Vac	S-pt	Conn	Hand	Aut-L	6									
Moon 6-48	122	Con	6-3¼x4½	224.0	3	L	Det	6	CI	Met-Gear	Pump	None	Hol-Crk	Gear	Rayfld	Vac	Op-Cir*	Delco	Auto	Delco	6									
Moon 6-75	135	Con	6-3⅝x5¼	234.8	3	L	Det	6	CI	Chain	Pump	None	Hol-Crk	Gear	Rayfld	Vac	Op-Cir*	Delco	Auto	Delco	6									
Murray-Mac 70-T	131	Bea	6-3½x5¼	303.1	3	H	Det	6	CI	Non-Met-G	Pump	Ther	Pressre	Gear	Stromb	Vac		Dixie	Hand	Bijur	6									
Nash 681-7	121	Own	6-3¼x5	248.9		H					Pump		Cir-Spl	Gear	Marvel	Vac		Wagnr	Hand††	Wagnr	6									
Nash 682	127	Own	6-3¼x5	248.9		H					Pump		Cir-Spl	Gear	Marvel	Vac		Wagnr	Hand††	Wagnr	6									
Nash 41-4	112	Own	4-3⅝x5	178.9		H					Pump		Cir-Spl	Gear	Schebl	Vac		Delco	Hand	Delco	6									
National Series BB	130	Own	6-3½x5¼	303.1	3	H	Det	6	CI	Chain	Pump	None	Hol-Crk	Gear	Rayfld	Vac	Cl-Cir	Delco	Auto	West	6									
Noma 3-C	128	Con	6-3¼x4½	224.0	3	L	Det	6	CI	Met-Gear	Pump	None	Hol-Crk	Pist	Claudl	Vac	Op-Cir*	Delco	Hand	Delco	6									
Noma 1-D	128	Bea	6-3⅝x5½	364.5	3	H	Det	6	CI	Chain	Pump	None	Hol-Crk	Pist	Zenith	Vac	Op-Cir		Hand		6									
Norwalk 4-30KS	116	Lyc	4-3½x5	192.4	3	H	Det	4	CI	Met-Gear	Ther	None	Cir-Spl	Pist	Zenith	Vac	Op-Cir	Delco	Hand	Dynet	6									
Oakland 6-44	115	Own	8-2 15/16x4¾	177.0	3	H	Det	6	Al	Chain	Pump	None	Hol-Crk	Gear	Marvel	Vac	Op-Cir	Remy	Hand††	Remy	6									
Ogren Six	134	Con	6-3⅝x5¾	234.8	3	L	Det	6	CI	Chain	Pump	None	Pressre	Gear	Rayfld	Vac	Op-Cir	Bosch	Hand	Bosch	6									
Oldsmobile 43A	115	Own	4-3 1/16x5½	224.3	4	H	Det	4	Al	Met-Gear	Pump	None	Cir-Spl	Gear	Zenith	Vac	S-pt	Remy	Hand	Aut-L	6									
Oldsmobile 46	122	Own	8-2⅞x4¾	246.7	3	L	Det	4	CI	Com-Gear	Pump	None	Hol-Crk	Gear	B&B	Vac	D-pt	Delco	Auto	Delco	6									
Oldsmobile 47	115	Own	8-2⅞x4½	233.7	3	L	Det	4	CI	Non-Met-G	Pump	None	Hol-Crk	Gear	Johnsn	Vac	D-pt	Delco	Auto	Delco	6									
Overland	100	Own	4-3⅜x4	143.1		L					Ther		Cir-Spl		Tillot	Gra	S-pt	Conn	Hand	Aut-L										
Packard Single-Six	116	Own	6-3⅜x4½	241.6	3	L	Det	6	CI	Chain	Pump	Ther	Hol-Crk	Gear	Own	Vac	S-pt	Own	Hand††	At-K	6									
Packard Twin-Six	136	Own	12-3x5	424.1	4	L	Det	6	CI	Chain	Pump	Ther	Hol-Crk	Gear	Own	Pr	S-pt	Delco	Hand††	Bijur	6									
Paige 6-44	119	Own	6-3¼x5	248.9	3	L	Det	6	CI	Non-Met-G	Pump	None	Cir-Spl	Pist	Stromb	Vac	Cl-Cir*	At-K	Hand	Remy	6									
Paige 6-66	131	Con	6-3¾x5	331.4	3	L	Det	6	CI	Met-Gear	Pump	Ther	Hol-Crk	Gear	Rayfld	Vac	Cl-Cir*	At-K	Hand	Remy	6									
Pan American 6-55	121	H-S	6-3¼x5	248.9	3	L	Det	6	CI	Met-Gear	Pump	None	Cir-Spl	Gear	Rayfld	Vac	Op-Cir	West	Hand	West										
Parenti 1922	121	Fal	6-3⅜x4¼	195.6	3	H	Det	6	CI	Met-Gear	Ther	None	Hol-Crk	Gear	Stromb	Vac	Cl-Cir*	Remy	Hand	Bijur	6									
Paterson 22-6-52	120	Con	6-3¾x4½	298.2	3	L	Det	1	CI	Met-Gear	Pump	None	Hol-Crk	Gear	Stromb	Vac	Cl-Cir	Delco	Hand	Delco	6									
Peerless 56-Series-7	125	Own	8-3¼x5	331.8	3	L	Int	4	CI	Non-Met-G	Pump	None	Hol-Crk	Gear	B&B	Vac	Cl-Cir	At-K	Hand	Aut-L	6									
Piedmont 4-30	116	Lyc	4-3½x5	192.4	3	L	Det	4	CI	Met-Gear	Ther	None	Cir-Spl	Pist	Carter	Vac	Op-Cir*	Delco	Hand	Dynet	6									
Piedmont 6-40	122	Con	6-3¼x4½	224.0	3	L	Det	6	CI	Com-Gear	Pump	None	Cir- Spl		Stromb	Vac	Op-Cir*	Remy	Hand	Remy	6									
Pierce-Arrow 33	138	Own	6-4x5½	414.7	4	D	Det	6	Al	Met-Gear	Pump	Ther	Pressre	Gear	Own	Pr		Delco	Hand	Delco	6									
Pilot 6-50	126	H-S	6-3¼x5	248.9	3	L	Det	6	CI	Met-Gear	Pump	None	Cir-Spl	Gear	Tillot	Vac	Cl-Cir	Conn	Hand	Bijur	6									
Porter 46	142	Own	4-4 3/16x6¾	478.4		H		4			Pump			Gear	Zenith	Pr		Berlg	Hand	West	1									
Premier 6-D	126¾	Own	6-3⅜x5½	295.3	4	H	Det	1	Al	Com-Gear	Pump	Ther	Hol-Crk	Gear	Johnsn	Vac		Delco	Hand	Delco	6									
Premocar 6-40	117	Fal	6-3½x4¼	195.6	3	H	Det	6	CI	Met-Gear	Ther	None	Cir-Spl	Gear	Stromb	Vac	Op-Cir	Wagnr	Hand	Wagnr										
Raleigh A6-60	122	H-S	6-3½x5	288.6	3	L	Det	1	CI	Met-Gear	Pump	None	Cir-Spl	Gear	Stromb	Vac		Bosch	Hand	Bosch	6									
Ranger A-22-4	116	Own	4-3⅝x5	178.9		L	Det	4			Pump				Zenith	Vac		West		Bijur										
Ranger A-22-6	123	Own	6-3⅝x5¼	234.8		H	Det	6		Chain	Pump				Stromb	Vac		Philb		Bijur										
R & V Knight R	116	Own	4-3¾x5	220.9	3	S	Det	4	CI	Chain	Ther	None	Hol-Crk	Gear	Stromb	Vac	S-pt	Wagnr	Hand	Wagnr	6									
R & V Knight J	127	Own	6-3½x4½	259.8	3	S	Det	6	CI	Chain	Ther	None	Hol-Crk	Gear	Stromb	Vac	S-pt	Wagnr	Hand	Wagnr	6									
Reo T-6-B	120	Own	6-3⅜x5	239.4	4	Lf	Det	6	Al	Met-Gear	Pump	None	Pressre	Pist	Rayfid	Vac	Op-Cir*		Hand	N.E	6									
Re Vere	131	Due	4-4¼x5	340.4	3	H	Det	4	Al	Chain	Pump	None		Gear	Stromb	Vac		Bosch	Hand	West	6									
Rickenbacker A	117	Own	6-3½x4¾	218.6	3	L	Det	6	CI	Chain	Pump	None	Hol-Crk	Gear	Stromb	Vac	Cl-Cir	Aut-L	Auto	Simms	6									
Roamer 4-75-E	128	R-D	4-4¼x6	3 40.4		Ho	Int	3	Al	Chain	Pump	None		Pist		Vac	CI-Cir	Split	Hand	West	6									
Roamer 6-54-E	128	Con	6-3½x5¼	303.1		L	Int	6	CI	Met-Gear	Pump	None		Pist	Stromb	Vac	CI-Cir	Bosch	Hand	Bijur	6									
Rock Falls 14	132	Con	6-3¾x5	331.4	3	L	Det	6	CI	Met-Gear	Pump	None	Hol-Crk	Gear	Rayfld	Vac		Bosch	Hand	West	6									
Rolls-Royce	143½	Own	6-4½x4¾	453.3		L	Int	3	Al	Met-Gear	Pump		Hol-Crk	Gear	Own	Pr	Cl-Cir**	Own	Hand	Bijur	12									
Roamer A-22	120	Con	6-3¾x4½	224.0	3	L	Det	6	CI	Met-Gear	Pump	None	Cir-Spl	Gear	Zenith	Vac		Conn	Hand	West	6									
Saxon 125-G	112	Gry	4-3½x5	192.4	3	H	Det	4	CI	Chain	Ther	None		Gear	Stromb	Vac	Cl-Cir*	Wagnr	Hand	Wagnr	6									
Sayers Six	119	Con	6-3¼x4½	224.0	3	L	Det	6	CI	Met-Gear	Pump	None	Hol-Crk	Gear	Stromb	Vac	Op-Cir	Delco	Hand	Delco	6									
Seneca 50	112	Lyc	4-3½x5	192.4	3	L	Det	4	CI	Met-Gear	Ther	None	Cir-Spl	Pist	Zenith	Vac	Op-Cir*	Aut-L	Hand	Aut-L	6									
Standard Eight 11	127	Own	8-3¾x5	331.8	3	L	Int	4	CI	Non-Met-G	Pump	None	Hol-Crk	Gear	Zenith	Vac	S-pt	Split	Hand	West	6									
Stanwood A-22	118	Con	6-3¼x4½	224.0	3	L	Det	6	CI	Met-Gear	Pump	None	Pressre	Gear	Stromb	Vac	Cl-Cir	At-K	Hand	West	6									
Stearns-Knight SKL 4	125	Own	4-3¼x5⅜	248.5	4	S	Det	4	CI	Chain	Pump	None	Hol-Crk	Gear	Rayfield	Vac	Cl-Cir	At-K	Hand	West	12									
Stephens 90	122	Own	6-3¼x4½	224.0	3	H	Det	6	CI	Non-Met-C	Ther	None	Hol-Crk	Gear	Tillot	Vac	Op-Cir	Conn	Hand	Aut-L	6									
Stevens-Duryea E	138	Own	6-4⅞x5½	510.4	3	L	Int	2	CI	Non-Met-G	Pump	Ther	Cir-Spl	Gear	Stromb	Vac	Cl-Cir	Berlg	Hand	West	6									
Studebaker Light Six	112	Own	6-3½x4½	207.1	3	L	Det	6	CI	Chain	Pump	None	Cir-Spl	Gear	Stromb	Vac			Auto												
Studebaker Special Six	119	Own	6-3½x5	288.6	3	L	Det	6	CI	Met-Gear	Pump	None	Cir-Spl	Gear	Stromb	Vac			Hand												
Studebaker Big Six	126	Own	6-3⅞x5	353.8	3	L	Det	6	CI	Met-Gear	Pump	None	Cir-Spl	Gear	B&B	Vac			Hand												
Stutz K	130	Own	4-4¾x6	360.8	4		Int	4	CI	Met-Gear	Pump	None	Cir-Spl	Pist	Stromb	Pr	S-pt	Delco	Hand	Remy	6									
Templar 445	118	Own	4-3⅜x5½	196.8	4	H	Det	4	CI	Chain	Pump	None	Hol-Crk	Gear	Stromb	Vac		Simms	Hand	Bijur	6									
Tulsa E-1-2-3	117	H-S	4-3½x5	192.4	3	L	Det	4	CI	Met-Gear	Ther	None	Cir-Spl	Gear	Zenith	Vac	D-pt	Conn	Hand	Dynet	6									
Velie 58	115	Own	6-3½x4¼	195.6	3	H	Det	6	CI	Non-Met-G	Ther	None	Hol-Crk	Gear	Stromb	Vac	Cl-Cir	At-K	Hand	Bijur										
Velie 48	115	Con	6-3¼x4½	224.0		L					Pump		Cir-Spl	Gear	Stromb	Vac		At-K	Hand	Bijur	6									
Velie 34	112	Fal	6-3½x4¼	195.6		H					Ther		Cir-Spl	Gear	Stromb	Vac		At-K	Hand††	West	6									
Vogue 6-55	124	H-S	6-3¼x5	248.9	3	L	Det	6	CI	Met-Gear	Pump	None		Gear	Schebl	Vac	Cl-Cir**	Conn	Hand	Aut-L										
Vogue 6-66	124	Con	6-3½x5¼	303.1	3	L	Int	6	CI	Met-Gear	Pump	None	Cir-Spl	Econ	Schebl	Vac	Cl-Cir**	Conn	Hand††	Aut-L										
Westcott A-44	120	Con	6-3¼x4½	224.0	3	L	Det	6	CI	Non-Met-G	Pump	None	Hol-Crk	Gear		Vac	Op-Cir*	Delco	Hand††	Delco	6									
Westcott C-48	125	Con	6-3½x5¼	303.1		L					Pump		Cir-Spl	Gear	Rayfld	Vac	S-pt	Delco	Hand††	Delco	6									
Wills Sainte Claire A-68	121	Own	8-3¼x4	265.4	4	H	Int	4	CI	Met-Gear	Ther	None	Hol-Crk	Gear	Zenith	Vac	Op-Cir**	Delco	Hand††	Delco	6									
Willys-Knight 20	118	Own	4-3⅜x4½	185.8							Ther		Cir-Spl	Gear	Tillot		S-pt	Conn	Hand	Aut-L	6									
Winther Six 61	120	H-S	6-3¼x5	248.9	3	L	Det	6	CI	Met-Gear	Pump	None	Cir-Spl	Gear	Stromb	Vac	Op-Cir	West	Hand	West	6									
Winton Six 95	132	Own	6-3⅜x5¼	347.9				9			Pump	None			Stromb	Vac		Bosch	Hand	Bijur	6									

Abbreviation interpretations on page 80.

Mechanical Specifications of 1922 Passenger Cars

TRANSMISSION										RUNNING GEAR											BEARINGS			
Clutch	GEAR-SET		UNI-VER-SAL JOINTS							TIRES						BRAKES					BEARINGS			
Make	Location	Type	Forward Speeds	Rear Axle Make	Final Drive	Rear Axle Type	Direct Gear Ratio	Torque Taken By	Propulsion Taken By	Front	Rear	Wheels	Rear Springs	Steering Gear Make	Speedometer Make	Service	Emergency	Location	Gearset	Rear Axle	Front Wheels (I)	Front Wheels (O)	MAKE AND MODEL
.....	Un W E..	3	.....	Tim...	S-B....	...	.....	TA...	TT...	32x4½	32x4½	Dis...	½E...	Gem...	.....	Int....	Ext....	R-W..	.....	.....	.....	.....	Leach.....999
Ans...	Un W E..	3	Fab....	Own...	S-B....	¾	5.10	Sp....	Sp....	32x4½	32x4½	Art...	½E...	CAS...	S-W...	Ext....	Ext....	.....	.....	.....	.....	.....	Lexington.....T-22
Ans...	Un W E..	3	Fab....	Own...	S-B....	¾	5.10	Sp....	Sp....	32x4	32x4	Art...	½E...	CAS...	.....	Ext....	Ext....	.....	.....	.....	.....	.....	Lexington.....S T-22
B&B..	Sep Un...	...	Met...	Tim...	S-B....	½	4.66	Sp....	Sp....	31x4	31x4	Art...	El....	Gem...	.....	Ext....	Ext....	.....	.....	.....	.....	.....	Liberty.....10-D
Own...	Un W E..	3	Met...	Tim...	S-B....	F	.....	TT...	TT...	33x5	33x5	Art...	½E...	Own...	.....	Ext....	Int....	R-W..	.....	.....	.....	.....	Lincoln.....
Own...	Sep Un...	4	Met...	Own...	S-B....	F	.....	TA...	RR...	35x5	35x5	Art...	¾E...	Own...	S-W...	Ext....	Int....	R-W..	Ball..	Roll..	R....	R....	Locomobile.....48
B&B..	Un W E..	3	Fab....	Col....	S-B....	¾	5.00	Sp....	Sp....	32x4	32x4	.....	½E...	Dit....	S-W...	Ext....	Int....	.....	Ball..	.....	R....	R....	Maibohn.....B
Own...	Un T T..	3	Met...	Own...	S-B....	¾	.....	TT...	TT...	32x4½	32x4½	Wir...	T½..	Own...	V-S...	Ext....	Int....	.....	Roll..	Ball..	R....	R....	Marmon.....34
Own...	Un W E..	3	.....	Own...	.....	¾	4.56	Sp....	RR...	31x4	31x4	.....	½E...	Own...	S-W...	Ext....	Int....	R-W..	.....	.....	.....	.....	Maxwell.....
B&B..	Sep Un...	3	Met...	Tim...	S-B....	F	3.50	TA...	Sp....	33x5	33x5	.....	½E...	.....	S-W...	Ext....	Int....	R-W..	.....	.....	R....	R....	MacFarlan.....T.V.
Own...	Sep Un...	4	Met...	Own...	S-B....	F	3.87	Sp....	Sp....	32x4½	32x4½	.....	½E...	Gem...	S-W...	Int....	Int....	.....	.....	.....	R....	R....	Mercer.....Series 5
B&B..	Un W E..	3	Fab....	Col....	S-B....	F	4.60	Sp....	Sp....	32x4	32x4	.....	½E...	Gem...	S-W...	Ext....	Int....	R-W..	.....	.....	R....	R....	Merit.....B-C
B&B..	Sep Un...	4	Met...	Amer...	S-B....	¾	.....	Sp....	Sp....	32x4½	32x4½	Wir...	½E...	Gem...	S-W...	Int....	Int....	.....	B&R..	Roll..	R....	R....	Meteor.....22-60
B&B..	Un TT...	3	Met...	Own...	S-B....	F	4.42	TT...	Sp....	33x4	33x4	Art...	FC...	Own...	S-W...	Ext....	Int....	R-W..	B&R..	Roll..	R....	R....	Mitchell.....F-50
B&B..	Un TT...	3	Met...	Own...	S-B....	F	4.42	TT...	Sp....	33x4	33x4	Art...	FC...	Own...	S-W...	Ext....	Int....	R-W..	B&R..	Roll..	R....	R....	Mitchell.....F-50
Own...	Un W E..	3	Met...	Own...	S-B....	¾	5.30	TA...	.....	32x3½	32x3½	Art...	.....	CAS...	S-W...	Ext....	Int....	R-W..	.....	Roll..	R....	R....	Monroe....S-9-10-11-12
B&B..	Un W E..	...	Met...	Tim...	S-B....	½	4.66	Sp....	Sp....	32x4	32x4	Art...	½E...	Gem...	S-W...	Ext....	Int....	R-W..	.....	.....	.....	.....	Moon.....6-48
B&B..	.....	...	Met...	Tim...	S-B....	½	4.45	TA...	Sp....	32x4½	32x4½	Art...	½E...	Gem...	S-W...	Ext....	Int....	R-W..	.....	.....	.....	.....	Moon.....6-75
B-L..	Un W E..	4	Met...	Tim...	S-B....	F	4.80	.....	.....	33x5	33x5	Art...	¾E...	Gem...	S-W...	Ext....	Ext....	R-W..	.....	.....	.....	.....	Murray-Mac.....70-T
B&B..	Un W E..	3	.....	.....	S-B....	½	4.50	Sp....	.....	33x4	33x4	Art...	½E...	Gem...	S-W...	.....	.....	.....	Roll..	Roll..	R....	R....	Nash.....
B&B..	Un W E..	3	.....	.....	S-B....	½	4.50	Sp....	.....	34x4½	34x4½	Art...	½E...	Gem...	S-W...	.....	.....	.....	Roll..	Roll..	R....	R....	Nash.....
B&B..	Un W E..	3	.....	Own...	S-B....	½	4.50	Sp....	.....	33x4	33x4	Art...	½E...	Gem...	S-W...	.....	.....	.....	Roll..	Roll..	R....	R....	Nash.....
B&B..	Un W E..	3	Met...	Col....	S-B....	F	4.08	TA...	Sp....	32x4½	32x4½	Art...	½E...	War...	S-W...	Ext....	Int....	R-W..	B&R..	Roll..	R....	R....	National.....Series BB
B&B..	Un W E..	3	Met...	Tim...	S-B....	½	4.45	Sp....	Sp....	32x4½	32x4½	Wir...	½E...	Lav...	S-W...	Ext....	Int....	.....	.....	.....	.....	.....	Noma.....3 C
B&B..	Un W E..	3	Fab....	Tim...	S-B....	½	.....	Sp....	Sp....	32x4½	32x4½	Wir...	½E...	Lav...	S-W...	Ext....	Int....	.....	.....	.....	.....	.....	Noma.....1 D
B&B..	Un W E..	3	Met...	Col....	S-B....	¾	5.00	Sp....	Sp....	32x3½	32x3½	.....	½E...	Dit....	S-W...	Ext....	Int....	R-W..	.....	.....	.....	.....	Norwalk, 4-30.....KS
Own...	Un W E..	3	Met...	W-M...	S-B....	...	4.66	Sp....	Sp....	32x4	32x4	Art...	½E...	Jac...	S-W...	Ext....	Int....	R-W..	.....	.....	.....	.....	Oakland.....6-44
B-L..	Un W E..	3	Met...	Col....	S-B....	F	4.00	Sp....	Sp....	33x5	33x5	.....	½E...	Gem...	S-W...	Ext....	Int....	R-W..	B&R..	Roll..	R....	R....	Ogren.....Six
B&B..	Un W E..	3	Met...	Own...	S-B....	¾	4.66	TT...	Sp....	32x4	32x4	Art...	½E...	Jac...	S-W...	Ext....	Int....	R-W..	B&R..	Roll..	B....	B....	Oldsmobile.....43A
Own...	Un W E..	3	Met...	W-M...	S-B....	F	4.93	Sp....	Sp....	33x4½	33x4½	.....	½E...	Jac...	S-W...	Ext....	Int....	R-W..	B&R..	Ball..	B....	B....	Oldsmobile.....46
B&B..	Un W E..	3	Met...	Own...	S-B....	¾	5.10	TT...	Sp....	32x4	32x4	Art...	½E...	Jac...	S-W...	Ext....	Int....	R-W..	B&R..	Roll..	B....	B....	Oldsmobile.....47
Own...	Un W E..	3	.....	Own...	S-B....	¾	4.50	Sp....	.....	30x3½	30x3½	Art...	Ca....	Own...	S-W...	.....	.....	.....	B&R..	Ball..	R....	R....	Overland.....
Own...	Un W E..	3	Fab....	Own...	S-B....	½	4.30	TA...	.....	33x4½	33x4½	Art...	½E...	Own...	S-W...	Ext....	Int....	R-W..	B&R..	Ball..	R....	R....	Packard.....Single Six
Own...	Un W E..	3	Met...	Own...	S-B....	½	4.36	TA...	.....	35x5	35x5	Art...	½E...	Own...	Wal...	Ext....	Int....	R-W..	Ball..	Ball..	R....	R....	Packard.....Twin Six
B&B..	Un W E..	3	Met...	Sal....	S-B....	¾	4.75	Sp....	Sp....	32x4	32x4	.....	½E...	Jac...	S-W...	Ext....	Int....	R-W..	Roll..	Ball..	R....	R....	Paige.....6-44
B&B..	Un W E..	3	Met...	Sal....	S-B....	¾	4.55	Sp....	Sp....	32x4½	32x4½	.....	½E...	Jac...	S-W...	Ext....	Int....	R-W..	Roll..	Ball..	R....	R....	Paige.....6-66
B&B..	Un W E..	3	Met...	Tim...	S-B....	½	4.90	Sp....	Sp....	33x4	33x4	.....	½E...	CAS...	S-W...	.....	.....	R-W..	Ball..	Roll..	R....	R....	Pan American.....6-55
Dt....	Un W E..	...	Fab....	.....	S-B....	...	4.88	.....	.....	32x4	32x4	Art...	T½..	Gem...	S-W...	Int....	Ext....	.....	.....	B&R..	R....	R....	Parenti.....1922
B&B..	Un W E..	3	Met...	StP....	S-B....	½	4.50	Sp....	Sp....	32x4½	32x4½	Art...	½E...	Jac...	S-W...	Ext....	Int....	.....	Ball..	Ball..	R....	R....	Paterson.....22-6-52
Own...	Un W E..	3	Met...	Own...	S-B....	¾	4.90	Sp....	Sp....	34x4½	34x4½	Art...	Pl....	Gem...	V-S...	Ext....	Int....	.....	B&R..	B&R..	R....	R....	Peerless....56 Series 7P
B&B..	Un W E..	3	Fab....	Tim...	S-B....	½	.....	Sp....	Sp....	32x3½	32x3½	Art...	½E...	Dit....	S-W...	Ext....	Ext....	.....	.....	.....	.....	.....	Piedmont.....4-30
B&B..	Un W E..	...	Fab....	Spa....	S-B....	½	4.25	Sp....	Sp....	32x4	32x4	Art...	½E...	Lav...	S-W...	Ext....	Int....	R-W..	.....	.....	.....	.....	Piedmont.....6-40
Own...	Sep Un...	3	Met...	Own...	S-B....	½	.....	TA...	Sp....	33x5	33x5	Art...	½E...	Own...	Wal...	Ext....	Int....	R-W..	Ball..	Ball..	R....	R....	Pierce Arrow.....33
B&B..	Un W E..	3	Met...	Col....	S-B....	¾	5.00	Sp....	Sp....	32x4½	32x4½	.....	½E...	Dit....	S-W...	Ext....	Int....	R-W..	Ball..	B&R..	R....	R....	Pilot.....6-50
Own...	Amid....	4	.....	Own...	S-B....	F	3.25	TA...	.....	35x5	35x5	Art...	El....	Own...	S-W...	.....	.....	.....	Ball..	Ball..	B....	B....	Porter.....46
B&B..	Un W E..	3	Met...	.....	S-B....	½	.....	Sp....	Sp....	32x4½	32x4½	Art...	½E...	Own...	S-W...	Ext....	Int....	R-W..	Ball..	.....	.....	.....	Premier.....6-D
B&B..	Un W E..	...	Met...	.....	S-B....	½	.....	Sp....	Sp....	32x4	32x4	.....	½E...	Dit....	.....	Ext....	Int....	.....	.....	.....	.....	.....	Premocar.....6-40
B&B..	Un W E..	3	Fab....	Col....	S-B....	¾	4.75	Sp....	Sp....	32x4	32x4	Art...	El....	Gem...	S-W...	.....	.....	.....	.....	.....	.....	.....	Raleigh.....A6-60
B&B..	Un W E..	3	.....	Col....	S-B....	¾	.....	.....	.....	32x4	32x4	Art...	½E...	Jac...	S-W...	.....	.....	.....	.....	.....	.....	.....	Ranger.....A-22-4
M&E..	Un W E..	3	.....	Tim...	S-B....	¾	.....	.....	.....	33x4½	33x4½	Wir...	½E...	Day...	Wal...	.....	.....	.....	.....	.....	.....	.....	Ranger.....A-22-6
B&B..	Un W E..	3	Met...	Sal....	S-B....	F	4.70	Sp....	Sp....	32x4	32x4	Art...	½E...	Jac...	S-W...	Ext....	Int....	R-W..	B&R..	Ball..	R....	R....	R & V Knight.....R
B&B..	Un W E..	3	Met...	Tim...	S-B....	½	4.90	Sp....	Sp....	32x4½	32x4½	Art...	½E...	Jac...	S-W...	Ext....	Int....	R-W..	B&R..	Roll..	R....	R....	R & V Knight.....XXJ
Own...	Sep Un...	3	.....	Own...	S-B....	½	4.70	Sp....	Sp....	33x4	33x4	Art...	½E...	Own...	.....	Ext....	Int....	.....	Roll..	Roll..	R....	R....	Reo.....T-6-B
B-L..	Un W E..	4	Met...	StP....	S-B....	¾	3.40	TT...	TT...	32x4½	32x4½	Wir...	¾E...	Gem...	S-W...	Ext....	Int....	R-W..	Roll..	Roll..	R....	R....	Revere.....
Own...	Un W E..	3	Met...	Own...	S-B....	¾	4.63	Sp....	Sp....	32x4	32x4	Art...	½E...	Gem...	S-W...	Ext....	Int....	.....	.....	.....	.....	.....	Rickenbacker.....A
B-L..	Un W E..	4	Fab....	Tim...	S-B....	½	3.77	TT...	Sp....	32x4½	32x4½	Wir...	FuC...	Jac...	S-W...	Ext....	Int....	R-W..	.....	.....	.....	.....	Roamer.....4-75-E
B&B..	Un W E..	3	Fab....	Tim...	S-B....	...	4.80	Sp....	Sp....	32x4½	32x4½	Wir...	FuC...	Jac...	S-W...	Ext....	Int....	R-W..	.....	.....	.....	.....	Roamer.....6-54-E
B&B..	Un W E..	3	Met...	Tim...	S-B....	F	4.90	TA...	Sp....	35x5	35x5	Art...	¾E...	Gem...	S-W...	Ext....	Int....	.....	.....	.....	R....	R....	Rock Falls.....14
Own...	Sep Un...	4	Met...	Own...	S-B....	F	3.25	TT...	TT...	33x5	33x5	Wir...	FC...	Own...	Wal...	Int....	Int....	R-W..	Ball..	Ball..	B....	B....	Rolls-Royce.....
Ful...	Un W E..	3	Met...	Col....	StB....	F	4.67	Sp....	Sp....	32x4	32x4	Art...	½E...	Gem...	S-W...	Ext....	Int....	.....	.....	.....	.....	.....	Romer.....A-22
Det...	Un W E..	3	Met...	.....	S-B....	¾	4.75	TA...	TA...	32x4	32x4	.....	.....	CAS...	S-W...	Ext....	Int....	R-W..	B&R..	.....	R....	R....	Saxon.....125G
B&B..	Un W E..	3	Met...	S-P....	S-B....	½	4.75	Sp....	Sp....	33x4	33x4	Art...	½E...	Lav...	S-W...	Ext....	Int....	R-W..	B&R..	Roll..	R....	R....	Sayers Six.....
B&B..	Un W E..	3	.....	.....	S-B....	F	4.75	Sp....	Sp....	31x4	31x4	Art...	El....	Dit....	S-W...	Ext....	Int....	R-W..	.....	.....	.....	.....	Seneca.....50
B&B..	Un W E..	3	Met...	Tim...	S-B....	½	4.45	Sp....	Sp....	34x4½	34x4½	Art...	½E...	Own...	S-W...	Ext....	Int....	R-W..	.....	Roll..	R....	R....	Standard Eight.....11
B&B..	Un W E..	3	Met...	StP....	S-B....	½	4.50	Sp....	Sp....	33x4	33x4	Art...	½E...	Gem...	S-W...	Ext....	Int....	R-W..	.....	Roll..	R....	R....	Stanwood.....A-22
Own...	Un W E..	3	Fab....	Own...	S-B....	½	4.50	TA...	Sp....	34x4½	34x4½	Art...	FC...	Own...	V-S...	Ext....	Int....	.....	B&R..	Roll..	R....	R....	Stearns Knight.....SKL4
B&B..	Un W E..	3	Met...	Tim...	S-B....	½	.....	Sp....	Sp....	33x4½	33x4½	.....	½E...	CAS...	S-W...	Ext....	Int....	R-W..	Ball..	.....	R....	R....	Stephens.....90
Own...	Un W E..	3	Met...	Own...	S-B....	F	3.94	TT...	Sp....	35x5	35x5	Art...	¾E...	Own...	Wal...	Ext....	Int....	R-W..	.....	.....	.....	.....	Stevens-Duryea.....E
Own...	Amid....	3	Fab....	Own...	S-B....	½	.....	Sp....	Sp....	32x4	32x4	Art...	½E...	Own...	.....	Int....	Ext....	.....	.....	.....	.....	.....	Studebaker....Light Six
Own...	Amid....	3	Met...	Own...	S-B....	½	.....	Sp....	Sp....	32x4	32x4	Art...	½E...	Own...	.....	Int....	Ext....	.....	.....	.....	.....	.....	Studebaker..Special Six
Own...	Amid....	3	Met...	Own...	S-B....	½	.....	Sp....	Sp....	33x4½	33x4½	Art...	½E...	Own...	.....	Int....	Ext....	.....	.....	.....	.....	.....	Studebaker.....Big Six
War...	Un W E..	3	Met...	Own...	S-B....	½	.....	TT...	TT...	32x4½	32x4½	.....	½E...	Gem...	S-W...	Int....	Int....	R-W..	Ball..	Ball..	R....	R....	Stutz.....K
B&B..	Un W E..	3	Fab....	U.S....	S-B....	½	4.40	Sp....	Sp....	32x4	32x4	.....	½E...	CAS...	S-W...	Int....	Int....	.....	.....	.....	.....	.....	Templar.....445
B&B..	Un W E..	...	Met...	Sal....	S-B....	F	4.50	Sp....	Sp....	33x4	33x4	.....	½E...	CAS...	S-W...	Ext....	Int....	.....	.....	.....	.....	.....	Tulsa.....E-1-2-3
Doo...	Un W E..	3	Met...	Tim...	S-B....	½	4.66	Sp....	Sp....	32x4	32x4	.....	½E...	Gem...	S-W...	Ext....	Int....	R-W..	Ball..	.....	R....	R....	Velie.....58
B&B..	Un W E..	3	.....	Tim...	S-B....	½	4.60	Sp....	.....	33x4½	33x4½	Art...	¾E...	Gem...	S-W...	.....	.....	.....	B&R..	Roll..	R....	R....	Velie.....48
B&B..	Un W E..	3	.....	Col....	S-B....	¾	4.63	Sp....	.....	33x4	33x4	Art...	½E...	Gem...	S-W...	.....	.....	.....	Ball..	B&R..	R....	R....	Velie.....34
B&B..	Un W E..	3	Fab....	Sal....	S-B....	¾	4.50	Sp....	Sp....	32x4	32x4	.....	½E...	Dit....	S-W...	Ext....	Int....	.....	.....	.....	.....	.....	Vogue.....6-55
B&B..	Un W E..	...	Fab....	Sal....	S-B....	¾	4.50	Sp....	Sp....	32x4½	32x4½	.....	½E...	Dit....	S-W...	Ext....	Int....	.....	.....	.....	.....	.....	Vogue.....6-66
B&B..	Un W E..	3	.....	Tim...	S-B....	½	4.66	Sp....	Sp....	32x4	32x4	Art...	½E...	Gem...	S-W...	.....	.....	.....	B&R..	Roll..	R....	R....	Westcott.....A-44
War...	Un W E..	3	.....	Tim...	S-B....	½	4.45	Sp....	.....	32x4½	32x4½	Art...	½E...	Gem...	V-S...	.....	.....	.....	B&R..	Roll..	R....	R....	Westcott.....C-48
Own...	Un W E..	3	Met...	Own...	S-B....	½	.....	TT...	Sp....	32x4½	32x4½	.....	½E...	Own...	Wal...	Ext....	Int....	R-W..	.....	.....	.....	.....	Wills Sainte Claire A-68
Own...	Un W E..	...	.....	Own...	S-B....	½	5.00	Sp....	.....	33x4	33x4	Art...	½E...	Own...	S-W...	.....	.....	.....	B&R..	Roll..	R....	R....	Willys-Knight.....20
War...	Un W E..	3	Met...	Tim...	S-B....	½	4.45	Sp....	Sp....	32x4½	32x4½	Art...	½E...	Lav...	S-W...	Ext....	Ext....	.....	B&R..	Roll..	R....	R....	Winther.....Six-61
.....	.....	4	.....	.....	S-B....	F	.....	TA...	.....	35x5	35x5	Art...	½E...	.....	.....	.....	.....	.....	Roll..	Roll..	R....	R....	Winton Six.....25

Detailed Specifications of 1922 Motorcycles

NAME AND MODEL	POWER PLANT: CYLINDERS: Number Bore and Stroke	CYLINDERS: Arrangement	Piston Displacement	Cycle Type	Lubrication Type	Carburetor Make and Size	Ignition Make	Max. H. P.	TRANSMISSION: GEAR RATIO: 1st	2nd	3rd	Change Speed Gear Type	Clutch Type	Final Drive	FRAME AND WHEELS: Wheelbase	Frame Type	Front Forks Type	Tires—Size (In.)	Road Clearance Exclusive of Pedals	Height of Saddle Above Ground	MISCELLANEOUS: Starting System	Lighting System	Brakes—Number and Type	Gas Tank Capacity (gals.)	Oil Tank Capacity (qts.)	Weight Empty (lbs.)	Speed—Normal Mtg. M. P. H.	Price	Price—Electrically Equipped
Cleveland 1922	1-2¼x2¾	Vert.	16.3	2	O&G	Scheb-	Bosch	5	6.2	10.3		Pos.	O-D	Chain	56¼	Dia.	Hel.	26x3	6	29½	K	Split	1-Ext.	2¼		180	35	$185	$220
Excelsior	2-3⅜x3½	Vee	61.0	4	Spl	Scheb-1	Bring	17	9.9	6.7	4.1	Prog.	D-D	Chain	59	Dia.	Hel.	27x3½	5½	30	K	Split	1-Int	3	3	385	70	365	
Evans G	1-2 x1¾	Vert.	90.0	2	O&G	Own	Bring		10.0					Belt	49	Loop.			7		P	Bring	Coast. Hub	1¼		70	28		140
Harley-Davidson	2-2⅜x3	Opp.	35.6	4	Spl	Scheb-¾	Own	6	12.9	8.3	5.0	Prog.	O-D	Chain	53½	Dia.	Hel.	26x3		28	K	OwnGen Exi Bat	1-Int†	2	2	260		310	340
Harley-Davidson	2-3⅛x3½	Vee	60.3	4	Spl	Scheb-1	Own	16	9.7	6.5	4.3	Prog.	D-D	Chain	60	Loop.	Hel.	28x3		30½	K	Own Gen Exi Bat	1-Int.	4¼		345	65	335	365
Harley-Davidson	2-3⅛x4	Vee	74.0	4	Spl	Scheb-1¼	Own	18	9.7	6.5	4.3	Prog.	D-D	Chain	60	Loop.	Hel.	28x3		30½	K	Own Gen Exi Bat	1-Int.† 1-Ext†	4¼		365	70	360	390
Henderson 4	2½x3½	Vert.	80.4	4	Force	Zen-1	Simms	24	7.5*	5.6	3.4	Prog.	O-D	Chain	60	Crad.	Hel.	27x3½	4¼	29	K	Split	1-Ext. 1-Int	3	3	416	72		475
Indian Scout	2-2½x3⅛	Vee	36.3	4	SpF	Scheb-¾ or Carter	Split	11	12.0	7.6	4.8	Prog.	O-D	Chain	54	Loop.	Leaf	26x3	5	28	K	Split	1-Ext.	2¾	3	300		345	
Indian Standard	2-3½x3½	Vee	60.8	4	SpF	Split	Split	18	10.5	6.6	4.2	Prog.	D-D	Chain	59½	L&CS.	Leaf	28x3	5½	32	K	Split	1-Ext. 1-Int	3¼	3	378½		370	
Indian Chief	2-3½x3½	Vee	60.8	4	SpF	Scheb-1½ or Carter	Split	18	11.9	7.5	4.8	Prog.	O-D	Chain	60⅜	Loop.	Leaf	28x3	5	30	K	Split	1-Ext. 1-Int	3⅜		410		435	
Ivor-Johnson 16-7CTS	2-3¼x3¾	Vee	31.1	2	Force	Scheb-	Bosch	8	6.5	3.7		Hub.	D-D	Chain	56	Dia.	Leaf	28x3	6	32	K	Prest.	1-Ext.	2	1½	260		250	.....
Ivor-Johnson 16-7	2-3¼x3¾	Vee	31.1	2	Force	Scheb-	Bosch	8	6.5	3.7		Hub.	D-D	Chain	56	Dia.	Leaf	28x3	6	32	K	Prest.	1-Ext.	2	1½	260		225	.....
Ivor-Johnson 16-4CTS	1-3¼x3¾	Vert.	31.1	4	Force	Scheb-	Bosch	5	6.5	3.7		Hub.		Chain	56	Dia.	Leaf	28x3	6	32	K	Prest.	1-Ext.	2	1½	220		200	.....
Ivor-Johnson 16-4C	1-3¼x4¼	Vert.	35.2	4	Force	Scheb-	Bosch	5	4.2				D-D	Chain	56	Dia.	Leaf	28x3	6	32	K	Prest.	1-Ext.	2	1½	220		175	.....
Ivor-Johnson 16-4B	1-3¼x3¾	Vert.	31.1	4	SpF	Scheb-	Bosch	4					D-D	Belt	56	Dia.	Leaf	28x3	6	32	K	Prest.	1-Ext.	2	1½	215		150	.....
Nera Car	1-2½x2¾	Vert.	13.5	2	O&G	B&B	Own	2½						Chain	55½			26x3	8½		K	Own	1-Int.	2		165		225	
Reading Standard 22T 22TE	2-3⅜x4	Vee	71.5	4	Spl	Scheb-1¼	Bosch	16	3.9	6.0	9.2	Prog.	D-D	Chain	58	Dia.	Hel.	28x3	5	30	K	Split	1-Ext. 1-Int	3	3½	343 366	65	345 375	
Schickel	1-3 x2½	Vert.	17.6	2	O&G	Own	Split Bring	3½	6.0	9.0		D-G	O-D	Chain	53	Keys.	Hel.	26x2¼	5½	29	K	Bring	1-Ext.	1½		160	30	185	195

*Reverse—5.87
†Optional.

ABBREVIATIONS

Lubrication Type: O&G—Mix Oil with Gasoline; Spl—Splash; SpF—Splash and Force; Force—Force Feed
Carbureter: Zen—Zenith; Scheb—Schebler; B.V.B—; Own—Own Make; D-G—Direct Gear
Fric—Friction; Hub—2-Speed Hub; Pos—Positive Clutch; Prog—Progressive Sliding; Plan—Planetary; Slid—Sliding
Frame Type: Crad—Cradle; Dia—Diamond; Keys—Keystone; L&CS—Loop and Cradle
Front Forks Type: Hel—Helical Spring; Leaf—Leaf Spring; Clutch Type; O-D—Oil Disk; D-D—Dry Disk
Starting System: K—Kick; P—Pedal; H—Hand Crank

Abbreviations for Passenger Car Specifications on Preceding Pages

ENGINE

Engine Make
H-S—Herschell Spillman
Con—Continental
Gry—Grey
Lyc—Lycoming
Sup—Supreme
Fal—Falls
Due—Duesenberg
Bea—Beaver
Ans—Ansted
Wis—Winsconsin
Wal—Walker
Wei—Weidely
Knt—Knight
D-L—Dort-Lycoming
Nor—Northway
Bud—Buda
R-D—Rochester-Duesenberg
Ignition Make
Conn—Connecticut
At-K—Atwater Kent
West—Westinghouse
Dynet—Dyneto
Aut-L—Auto-Lite
Wagnr—Wagner
Split—Splitdorf
Berlg—Berling
Philb—Philburn
N.E.—North East
Eisem—Eisemann
Cylinder Shape
H—Head
L—At side
S—Sleeve
L†—At side and head
T—Opposite
Ho—Horizontal
Camshaft Drive
Met-Gear—Metal Gear
Com-Gear—Combination Gear
Non-Met-G—Non-Metal Gear
Cooling Control
Ther—Thermostat
Shut—Shutter
T&S—Thermostat and Shutter
Oil Pump Type
Eccn—Eccentric
Pist—Piston
Fuel Feed
Vac—Vacuum
Pr—Pressure
Gra—Gravity
Ignition Control
Auto—Automatic
††—Also Automatic
Generator Make
Same as IGNITON MAKE including:
G&D—Gray & Davis
L-Nev—Leece-Neville
Cylinder Head
Det—Detachable
Int—Integral
Piston Material
CI—Cast Iron
Al—Aluminum
Cooling
Ther—Thermo-Siphon
Lubrication System
Hol-Crk—Hollow Crankshaft
Cir-Spl—Circulating Splash
Pressre—Pressure
Carburetor Make
Stromg—Stromberg
Schebl—Schebler
Rayfld—Rayfield
Tillot—Tillotson
B&B—Ball & Bal
Johnsn—Johnson
Claudl—Claudel
Yale&T—Yale & Town
Ignition Type
D-pt—Double Point
S-pt—Single Point
**—Also Double Point
*—Also Single Point
Cl-Cir—Closed Circuit
Op-Cir—Open Circuit

TRANSMISSION

Clutch Type
D-D—Dry Disk
Con—Cone
Pla—Plate
D-M—Disk Multiple
D-O—Disk in Oil
C-O—Cone in Oil
Rear Axle Make
Tim—Timkin
Sal—Salisbury
S-P—Stan-Par
Col—Columbia
Ad—Adams
Per—Peru
Fli—Flint
W-M—Weston Mott
StP—Standard Parts
Spa—Spacke
U.S.—U. S. Axle Co.
Clutch Make
B-L—Brown-Lipe
B&B—Borg & Beck
War—Warner
Mun—Muncie
Nor—Northway
G-L—Grant Lees
Det—Detlaff
Hoo—Hoosier
Dt—Detroit
Ans—Ansted
M&E—Merchant & Evans
Ful—Fuller
Doo—Dooley
Final Drive
H-B—Helical Bevel
S-B—Spiral Bevel
Bev—Bevel
StB—Straight Bevel
Propulsion Taken
Sp—Springs
TT—Torque Tube
RR—Radius Rods
Gearset Location
Un W E—Unit with Engine
Sep Un—Separate Unit
Un TT—Unit with Torque Tube
Amid—Amidships
Universal Joints
Fab—Fabric
Met—Metal
Lea—Leather
Rear Axle Type
F—Floating
¾—¾ Floating
½—Semi-Floating
Torque Taken
TA—Torque Arm
Sp—Springs
TT—Torque Tube

RUNNING GEAR

Wheels
Art—Artillery
Dis—Disk
Wir—Wire
St—Steel
Speedometer Make
S-W—Stewart-Warner
Van—Van Sicklen
Wal—Waltham
J-M—Johns-Manville
Rear Springs
½E—Semi-Elliptic
¾E—Three-quarter Elliptic
FC—Floating Cantilever
Pl—Platform
Ca—Cantilever
T½—Transverse SemiElliptic
El—Elliptic
FuC—Full Cantilever
Steering Gear Make
Jac—Jacox
War—Warner
Gem—Gemmer
Dit—Ditweiler
Jon—Jones
Lav—Lavine
Fos—Foster
Woh—Wohlrab
Day—Dayton

BRAKES

Service
Ext—External
Int—Internal
I&E—Internal and External
Emergency
Int—Internal
I&E—Internal and External
Location
R-W—Rear Wheel

BEARINGS

Roll—Roller
B&R—Ball and Roller

Specifications of 1922 Farm Lighting Plants

NAME AND MODEL	PLANT					ENGINE							GENERATOR			BATTERY	
	Voltage	Drive	Automatic Start	Automatic Stop	Unit or Separate Construction	No. Cyls. and Bore X Stroke	Fuel	Type of Speed Governor	Type Ignition	Normal R. P. M.	Crankshaft Bearings	Engine Cooling	Rated K. W.	No. Poles and Kind Field Winding	No. and Kind Generator Bearings	Standard 72-hr. Rating	Is Power Pulley Provided?
Alamo, D	32	Dir	No	Yes	Unit	1-2¼x3¼	G	Elec	Mag	2000	2-1-Brns. 1-Ball	Water	1	2-Shunt	1-Brns. 1-Ball	190	No
Cushman, No. 15	32	Blt	Yes	No	Unit	1-4x4	G	Cent	Bat	800	2-Dir Cst.	Water	1	2-Comp	2-Brns	opt	Yes
Dayton	32	Blt	No	No	Sepr									2-Shunt	2-Brns	opt	
Dayton	32	Blt	No	No	Sepr										2-Brns	opt	
Delco, 308	16	Dir	SA		Unit	1-2½x3	G or K	Elec	Bat			Air		4-Shunt			No
Delco, 608	32	Dir	SA		Unit	1-2½x3	G or K	Elec	Bat			Air		4-Shunt			No
Delco, 616	32	Dir	SA		Unit	1-2½x3	G or K	Elec	Bat			Air		4-Shunt			No
Delco, 620	32	Dir	SA		Unit	1-2½x3	G or K	Elec	Bat			Air		4-Shunt			No
Delco, 866	32	Dir	SA		Unit	1-2½x5	G or K	Elec	Bat			Air		4-Shunt			No
Delco, 1266	32	Dir	SA		Unit	1-3x5	G or K	Elec	Bat			Air		4-Shunt			No
Delco, 1275	110	Dir	SA		Unit	1-3x5	G or K	Cent	Mag			Air		4-Comp			No
Delco, 1286	32	Dir	SA		Unit	1-3x5	G or K	Elec	Bat			Air		4-Shunt			No
Delco, 1295	110	Dir	SA		Unit	1-3x5	G or K	Elec	Bat			Air		4-Shunt			No
Delco, 336	32	Dir	SA		Unit	1-3¾x6	G or K	Elec	Bat			Air		6-Shunt			No
Delco, 316	110	Dir	SA		Unit	1-3¾x6	G or K	Elec	Bat			Air		6-Shunt			No
Delco, 320	110	Dir	SA		Unit	1-3¾x6	G or K	Elec	Bat			Air		6-Shunt			No
Delco, 312	110	Dir	SA		Unit	1-3¾x6	G or K	Cent	Mag			Air		6-Comp			No
Delco, 346	55	Dir	SA		Unit	1-3¾x6	G or K	Elec	Bat			Air		6-Shunt			No
D-Light, L1500	32	Dir	No	Yes	Unit	1-3½x5	G or K	Cont	Bat	1200	2-Ball	Air	1½	4-Shunt			Yes
Electrion	32	Dir	Yes	Yes	Unit	1-2⅞x3	G or K	Elec	Mag	1600	2-Roller	Water	1	2-Shunt	1-Brns	80	No
Fairbanks Morse, 1½	32	Blt	No	No	Unit	1-3½x5	G	Cent	Mag	500	2-Bab	Water	.6	-Shunt	2-Ball		Yes
Fairbanks Morse, 3	32	Blt	No	No	Unit	1-4½x6	G or K	Cent	Mag	475	2-Bab	Water	1.5	-Shunt	2-Ball		Yes
Fairbanks Morse, 1½	32	Blt	No	No	Unit	1-3½x5	G or K	Cent	Mag	500	2-Bab	Water	.6		2-Ball		Yes
Fairbanks Morse, 3	32	Blt	No	No	Unit	1-4½x6	G or K	Cent	Mag	475	2-Bab	Water	1.5	4	2-Ball		Yes
Fort Dearborn	32	Gear	No	No	Unit	1-2⅝x5	G or K	Cent	Mag	1000	2-Ball	Air	1	4-Shunt	2-Brns	80-160	Yes
Globe	40	Dir	No	No	Unit	1-2¾x4	G or K	Cent Elec	Bat	1250	2-Bab	Water	1.25	4-Series	2-Ring	110-150-180	Yes
Kero Lectric	32	Dir	No	No	Unit	1-3¼x3¼	G or K	Cent & Elec	Bat	1150	2-	Water	1	2	1-Ball	90	Yes
Kohler, B	110	Gear	Yes	Yes	Unit	4-2x3	G	Elec	Mag	1000	2-Plain	Air & Water	1.5	4-Series & Shunt	1-Ball		No
Lalley Light, 1922 H. W.	32	Dir	No	Yes	Unit	1-2½x2	G	Cent	Bat	1800	2-Ball	Water	1.25	-Comp	2-Ball	115	No
Langstadt-Meyer, 2-C-6	110	Dir	No	No	Unit	4-3½x4½	G	Cent	Mag	1100	2-Die	Water	6	4-Comp	1-Brns	opt	No
Langstadt-Meyer, 2-C-4	110	Dir	No	No	Unit	4-3½x4½	G	Cent	Mag	950	2-Die	Water	4	4-Comp	1-Brns	opt	No
Langstadt-Meyer, B-1½	32	Dir	No	No	Unit	1-3½x4½	G or K	Cent	Bat	1200	2-Die	Water	1.5	4-Shunt	1-Brns	128 & 218	Yes
Langstadt-Meyer, D-1½	32	Blt	No	No	Sepr					1800			1.5	-Series & Shunt	2-Brns	128 & 218	
Lincoln-Light, 21	32	Dir	No	Yes	Unit	1-3x3	G or K	Elec	Bat	1200	2-Ball	Water	1	4-Shunt	2-Ball	190	Yes
Main, DC No. 1250	32-110	Dir	Yes	Yes	Unit	1-2½x2½	G or K	Elec	Bat	1150	2-Brns	Water or Oil	1.25	4-Comp	2-Ball	90	Yes
Main, MCF	32-110	Blt	No	No	Sepr	1-3½x5	G or K	Cent	Mag	400	2-Brns	Water	8	2-Shunt	2-Brns	90	Yes
Main, 3-EF	110	Blt	No	No	Sepr	1-4½x7	G or K	Cent	Mag	325	2-Brns	Water	2	4-Shunt	2-Ring	160	Yes
Marco	32	Chn	No	No	Unit		G or K	Cent	Mag	800	2-Bab	Air	1.5	4-Series & Shunt	2-Ball	opt	Yes
Matthews, H	32	Dir	Yes	Yes	Unit	1-2x3	G		Bat	1250	2-Plain	Water	3	2-Shunt	2-Plain		No
Matthews, JR	32	Dir	Yes	Yes	Unit	1-3x3	G	Elec	Bat	1250	2-Plain	Water	1	4-Shunt	1-Plain		No
Matthews, G	110	Dir	Yes	Yes	Unit	4-3¾x4	G	Cent	Mag	1000	3-Plain	Water	10	4-Shunt & Comp	2-Plain		Yes
Matthews, E	110	Dir	Yes	Yes	Unit	4-3½x5	G	Elec	Mag	900	3-Plain	Water	6	4-Shunt	2-Plain		No
Matthews	110or220	Dir	No	No		4-4½x6	G or K	Cent	Mag	1000	4-Plain	Water	20	4-Shunt & Comp	2-Plain		No
National, A	32	Chn	Yes	Yes	Unit & Sepr	1	G or K	Cent	Mag	1800	2-Die	Air	1.25	4-Shunt	2-Ball	200	Yes
Owen	32	Dir	Semi	Semi	Unit	1-3x4	G	Cent	Bat	1400	3-Sleeve	Air & Water	1.25	4-Series & Shunt	1-Sleeve	110	opt
Phelps, D	32-110	Dir	No	Yes	Unit	1-3x4	G or K	Cent	Bat & Mag	1265	2-Ball	Water	1.5	4-Comp	2-Ball	140, 290	Yes
Powerlite	32	Blt	No	No	Sepr								1	4-Series	2-Brns	115 & 230	No
Powerlite	32	Dir	No	Yes	Unit	1-3¼x3¼	G or K		Bat	1200	2-Brns	Water	1	-Series	1-Ball 1-Brns	115 & 230	Yes
Reeco	32	Dir	No	No	Unit	1-4x5	G or K	Cent	Mag	475	2-Sleeve	Water	1.25	4-Shunt	2-Ring	opt	Yes
Regalite	32	Dir		No	Unit	1-3½x3½	G or K		Bat	600	2-Brns	Air	.75	-Comp	1-Brns		Yes
Rohaco		Dir	No	No	Unit	1-3x4	G or K	Cent	Bat	1200	2-Ball	Water	1.5	4-Comp	2-Ball	170	Yes
Stearns, DE LUXE	32	Dir	Yes	Yes	Unit	1-2⅝x3	G or K	Elec	Mag	1500	2-Ball	Water	.75	2	1-Ring	110	opt
Sturtevant	80-250	Dir	No	No	Unit	4-3x5	G or K	Cent	Mag		2-Plain	Water	5	6-Comp	1-Plain 1-Brns		No
Sturtevant	80-250	Dir	No	No	Unit	4-4x6	G or K	Cent	Mag		3-Bab	Water	10	6-Comp	1-Plain 1-Brns		No
Sturtevant	20-250	Dir	No	No	Unit	6-4x6	G or K	Cent	Mag		4-Bab	Water	15	6-Comp	1-Plain 1-Brns		No
Sunbeam Farm-Lite	32	Dir	Yes	Yes	Unit	1-2¼x3	G	Elec	Bat	1250	1-Ball	Water	.65	4-Series & Shunt	1-Ball	75	Yes
Swanlite	32	Dir	No	No	Unit	1-3x4	G or K		Bat	1200	2-Die	Water	1.25	4-Comp	2	94-323	Yes
Swartz-Light, D	32	Dir	Yes	No	Unit	1-3x3¼	G	Elec	Mag	850	3-Bab	Water	1	4-Series	1-Ball	218	No
Swartz-Light, Pioneer	32	Blt	Yes	No	Sepr	1-5x6½	G	Cent	Mag	450	2-Bab	Water	1.5	4-Series	2-Ball	218	Yes
Swartz-Light, Pioneer	110	Blt	Yes	No	Sepr	1-5x6½	G	Cent	Mag	460	2-Bab	Water	2.75	4-Series	2-Ball	218	Yes
Upco Lite, 15-25 K. W.		Dir	No	No		4-4¾x6 4-6x7	G or K	Cent	Mag	900, 750	-Brns	Air & Water	25	-Comp	1-Brns		opt
Upco Lite, 5 K. W.	110	Dir	No	Yes	Unit	4-3½x4½	G or K	Cent	Mag	1100	3-Brns	Air & Water	6	6-Comp	1-Brns	220	opt
Universal, M	32	Dir	No	Yes	Unit	1-2¾x4	G	Cent	Bat	1200	2-Brns	Water	1	4-Comp	1-Roller	120	Yes
Western Electric, 15 D-C	32	Dir	No	Yes	Unit	1-3½x4½	G or K	Cent	Bat	1000	1-Plain	Air	1.5	4-Shunt	1-Plain	288	Yes
Western Electric, 5-C-B-C	32	Blt	No	No	Unit	1	G or K	Cent	Mag	1800	2-Plain	Water	.5	2-Shunt	2-Plain	144	Yes
Willys Light, L2	32	Dir	No	Yes	Unit	1	G or K		Bat	1750	2-Sleeve	Air	1.25	4-Shunt		160	Yes
Winton, W 17-5 KW		Dir	No	No	Unit	4-3x4	G	Cent	Mag	1200	2-Bab	Water	5	4-Comp	1-Bab		No
Winton, W 2-7½ KW		Dir	No	No	Unit	6-3x4	G	Cent	Mag	1200	3-Bab	Water	7.5	4-Comp	1-Bab		No
Wisconsin, H 5	32	Blt	No	No	Sepr	1-6½x9	G or K	Cent	Bat	350	2-Bab	Water		2-Shunt	2-Brass	opt	Yes
Wisconsin, No. 4	32	Blt	No	No	Sepr	1-5½x6	G or K	Cent	Bat	380	2-Bab	Water		2-Shunt	2-Brass	opt	Yes
Wisconsin, No. 3	32	Blt	No	No	Sepr	1-3¼x4½	G or K	Cent	Bat	400	2-Bab	Water		2-Shunt	2-Brass	opt	Yes
Wisconsin, No. 2	32 & 65	Blt	No	No	Sepr	1-3¼x4½	G or K	Cent	Bat	400	2-Bab	Water		2-Shunt	2-Brass	opt	Yes
Werthington	30	Dir & Blt	No	No	Sepr	1-4¾x7	K	Cent	Mag	475	2-Bab	Water	1.5	-Shunt	2	150-180 225-265	Yes

ABBREVIATIONS FOR 1922 FARM LIGHTING SPECIFICATIONS

PLANT
Blt—Belt
Chn—Chain
Dir—Direct
SA—Semi Automatic
Sepr—Separate

ENGINE
Bab—Babbitt
Bat—Battery
Cent—Centrifugal
Dir Cst—Direct Cast
Elec—Electric
G—Gasoline
K—Kerosene
Mag—Magneto

GENERATOR
Brnz—Bronze
Comp—Compound

BATTERY
opt—Optional

Specifications of Electrical Equipment Found on 1922 Passenger Cars

MAKE AND MODEL	IGNITION						GENERATOR				
	System	Make	Control	Breaker point opening	Spark lever retarded	Spark plug thread length	Make	Charging rate at m. p. h.	Motor Make	Battery Make	Amp. Hr.
Ambassador R	Closed	Bosch	Hand				West	12–7	West	Exide	120
American C		At-Kent	Hand	.006			G&D		G&D	Willard	96
Anderson Ser. 40	Single*	Remy	Hand	.120	5°	½	Remy	10–20	Remy	Willard	111
Apperson Eight	Single**	Remy	Hand	.020			Bijur	15–20	Bijur	Exide	104
Auburn Beauty Six, 6-51	Open	Remy	Hand	.020	12°		Remy		Remy	Exide	90
Beggs 20T		Conn	Hand						A-L	Exide	
Biddle B-1, B-5	Single	Simms	Hand				G&D	10–	G&D	Willard	
Brewster 02		Bosch	Hand	.020	0°		USL	12–	USL	USL	80
Buick, Four 22-34-37	Single	Delco	H&A	.020	7°	5/8	Delco	15–25	Delco	Exide	
Buick, Six 22-44-47	Single	Delco	H&A	.020	7°	5/8	Delco	15–25	Delco	Exide	
Buick, Six 22-48-50	Single	Delco	H&A	.020	7°	5/8	Delco	15–25	Delco	Exide	
Cadillac 61	Double	Delco	Auto				Delco		Delco	Exide	130
Case X	Single**	Delco	Hand	.021	0°	¾	Bijur	15–20	Bijur	Willard	135
Chalmers 35-C	Closed	Remy	Hand				A-L	12–20	A-L	Presto-O-L	106
Chalmers 35-C											
Champion, Tourist		Dyneto	Hand				Dyneto				
Champion, Special		Dyneto	Hand				Dyneto				
Chandler, Six		Bosch	Hand				Bosch				
Chevrolet 490	Closed	Remy	Hand				A-L	7–15	A-L	Willard	91
Chevrolet FB		Remy					A-L				
Cleveland 40	Single*	Bosch	Hand	.018	0°	13/16	Bosch	14–25	Bosch	Prest-O-L	94
Climber, Six S	Double	Bosch	Hand		0°	¾	West		West	Willard	100
Climber, Four K	Double	At-K	Hand		2°	¾	West			Willard	100
Cole 870	Double	Delco	Hand				Delco		Delco	Willard	125
Columbia CC	Single**	At-K	Hand				A-L		A-L	Prest-O-L	80
Comet 6-C53-2	Open	Wagner	Hand						Wagner	Willard	
Crawford 22-6-49		At-K	Hand				West				
Crow-Elkhart L		Conn	Hand				Dyneto		Dyneto	Prest-O-L	
Crow-Elkhart S		Conn					Dyneto		Dyneto	Prest-O-L	
Cunningham V-4	Double	Delco	H&A	.020	5°		Delco	8–20	Delco	Willard	110
Daniels D-19	Double		H&A	.018		5/8	Delco	14–20	Delco	Willard	145
Davis 61-67		Delco	Hand				Delco		Delco	Willard	96
Dixie Flyer H	Single	Eisemann	Hand	.015	10°	½	Dyneto	15–25	Dyneto	Willard	80
Dodge Brothers	Single**	N.E	Auto	.020			N. E		N. E	Willard	50
Dorris 6-80	Single	Bosch	Hand				West		West	Willard	138
Dort 19	Closed	Conn	Hand	.20	0°	½	Bosch	12–15	Bosch	USL	90
Driggs 1922	Closed	Bosch	Hand				Bosch	10–20	Bosch	Prest-O-L	84
Duesenberg, Straight 8	Double**	Delco	Hand				Delco	15–20	Delco	Exide	135
Du Pont A	Single	Eisemann	Hand				West				
Durant A-22	Closed	A-L	Hand				A-L		A-L	USL	
Durant B-22		A-L									
Earl 40	Single	Conn	Hand				A-L	13–	A-L	USL	95
Elcar K-4	Open	Delco	Hand	.020		½	Delco	12–12	Delco	Willard	
Elcar 7-R	Open	Delco	Hand	.020		½	Delco	12–12	Delco	Willard	
Elgin K-1	Closed	Wagner	Hand	.021	5°	½	West	11½–25	West	Willard	90
Essex	Single**	Bosch	H&A	.018		5/16	Bosch		Bosch	Exide	80
Falcon Light Four	Open	At-K	Hand				West	8–15	West	USL	84
Falcon Six	Open	At-K	Hand				West	8–15	West	USL	84
Falcon 12-D-22			Hand				Bosch		Bosch	Exide	100
Ferris 60		Split	Hand				Leece-N	15–20	Leece-N	Willard	120
Ferris 70	Closed		H&A				Leece-N	15–20	Leece-N	Willard	120
Ford T	Open	Own	Hand				Own	10–15	Own	Own	80
Fox		Bosch					West				
Franklin 9-B	Single**	At-K	Auto	.007		½	N. E	12–18	N. E	Willard	63
Frontenac		Delco									
Gardner R.T.S.	Double**	West	Hand	.012	0°	½	West	12–10	West	Willard	94
Grant	Closed	At-K	Hand	.015			Bijur	13–25	Bijur	Prest-O-L	100
Goodspeed	Open	Split	Auto				West		West	Prest-O-L	105
H.C.S. Ser. 3		Delco	Hand				Delco		Delco	Willard	
Handley-Knight B	Closed	A-L	S. A	.020	½°		A-L		A-L	USL	
Hanson 60		Delco	Hand				Delco	10–20	Delco	Prest-O-L	80
Hatfield A-42	Single*	Conn	Hand	.016	2°	¾	Dyneto	10–15	Dyneto	Willard	100
Haynes 75	Single**	Kingston	Hand	.018	5°		Leece-N	15–18	Leece-N	Willard	132
Haynes 55	Single**	Kingston	Hand	.018	5°		Leece-N	15–18	Leece-N	Willard	132
Holmes Ser. 4		Eisemann	Auto	.012	9½°	7/8	Dyneto	12½–17	Dyneto	Willard	70
Hudson, Super-Six	Single**	Bosch	H&A	.018		21/32	Bosch		Bosch	Exide	105
Hupmobile R	Closed	At-K	Hand	.006	5°	½	West	16–19	West	Willard	117½
Jackson 6-38	Single	Remy	Hand				A-L				
Jordan M.X.	Open	Delco	Hand	.022		13/32	Delco	16–8	Delco	Willard	108
Jordan F	Open	Delco	Hand	.022	10°	15/32	Delco	14–10	Delco	Willard	108
King K	Closed	At-K	Auto	.018	5°	11/16	West	12–25	West	Prest-O-L	120
Kissel 45	Single*	Remy	H&A	.020	6°	5/8	Remy	15–20	Remy	Willard	117
Kline Kar 6-55-K	Double**	Conn	Hand	.020		3/8	Wagner	14–15	Wagner	Prest-O-L	100
Kurtz, Automatic A	Double**	West	Hand			7/8	West	12–25	West	Prest-O-L	
Lafayette 134	Double	Delco	H&A	.015		¾	Delco	18–35	Delco	Exide	150
Leach 999	Single*	Delco	Hand				Delco		Delco	Prest-O-L	
Lexington T-22	Open	Conn	Hand	.012			G&D	14–25	G&D	Willard	100
Lexington ST-22	Open	Conn	Hand	.012			G&D	14–25	G&D	Willard	100
Liberty 10-D	Open	Wagner	Hand				Wagner	15–18	Wagner		105
Lincoln	Closed	Delco	H&A				Delco	20–15	Delco	Exide	135

ABBREVIATIONS: Ignition: *Open **Closed *At-K*, Atwater-Kent; *Conn.*, Connecticut; *West*, Westinghouse; *N. E.*, North East; *Auto*, Automatic; *H. & A.*, Hand & Automatic; *S. A.*, Semi-Automatic; Generator: *A-L.*, Auto-Lite; *G. & D.*, Gray & Davis; *Leece-N.*, Leece-Neville; *N. E.*, North East; *Split*, Splitdorf; Motor: *A. -L.*,

Giving Ignition, Starting, Lighting, Battery and Lamp Data

System Voltage	Wiring System	Units Combined	Fuses Amp.	Base Contact	Head-lights CP.	Side-lights CP.	Tail-lights CP.	Dash-lights CP.	Are Dash & Tail Lights in Series	Diameter of Head Light Lens	MAKE AND MODEL
6	1	S	15, 30	Single	50		2		No	12	Ambassador R
6	1	GM	20	Sgl.&Dbl.	15	4	2	2	No	9	American C
6	1	S		Sgl.&Dbl.	21	2	2	2	No	8¾	Anderson Ser. 40
6	1	S	10	Sgl.&Dbl.	18		2	2	No		Apperson Eight
6	1	S		Sgl.&Dbl.	20	4	2	2		9 7/16	Auburn Beauty Six, 6-51
	2	S									Beggs 20T
		S	10	Double	17	2	2	2	No	9⅜	Biddle B-1, B-5
12	1	GM	10, 30	Sgl.&Dbl.	21	4	2	2	Yes	9¼	Brewster 02
6	1	GIM		Single	21		2	2	No	8 5/32	Buick, Four 22-34-37
6	1	GIM		Single	21		2	2	No	8½	Buick, Six 22-44-47
6	1	GIM		Single	21		2	2	No	8½	Buick, Six 22-48-50
6	1	GM									Cadillac 61
6	1	S	5	Single	21	4	2	2	No	8½	Case X
6	1	GI									Chalmers 35-C
											Chalmers 35-C
											Champion, Tourist
											Champion, Special
6											Chandler, Six
6	1	GI	20	Single	17		2			8⅛	Chevrolet 490
											Chevrolet FB
6	1	S	5, 20	Sgl.&Dbl.	17		2	2	No	8⅝	Cleveland 40
6	1	S	15, 30	Sgl.&Dbl.	28				No	10	Climber, Six S
6	2	S	15	Sgl.&Dbl.	28				No	10	Climber, Four K
6	1	S		Sgl.&Dbl.	21	5	4	5	No	9½	Cole 870
6	1	S									Columbia CC
	2	GIM			21		2	2	Yes	9	Comet 6-C53-2
6											Crawford 22-6-49
	1	S									Crow-Elkhart L
	1	S									Crow-Elkhart S
6	1	S		Sgl.&Dbl.	21	4	2	2	No	11	Cunningham V-4
6	1	S		Sgl.&Dbl.	21	4	2	2	No	9⅜	Daniels D-19
6	1	S									Davis 61-67
6	2	S	10	Double	32	4	2	2	Yes	7⅝	Dixie Flyer H
12	1	GM		Single	15		2	2	Yes	8¾	Dodge Brothers
6	1	S	15	Single	21	2	2	2	No	9½	Dorris 6-80
6	1	S	10	Single	16		4	2	Yes	9	Dort 19
6	1	GI									Driggs 1922
6	1	GI		Single	21	4	4	4	No	9	Duesenberg, Straight 8
6											Du Pont A
	1	GI									Durant A-22
	2										Durant B-22
6	1	GI	20	Sgl.&Dbl.	21	2	2	2	No	8¾	Earl 40
6	1	S		Single	21	4	2	2	No	9½	Elcar K-4
6	1	S		Single	21	4	2	2	No	9½	Elcar 7-R
6	1	S	5, 20	Sgl.&Dbl.	21	2	2	2	No		Elgin K-1
6	1	S	5, 10	Single	15	2	2	2	No	8⅝	Essex
6	1	S									Falcon Light Four
6	1	S							Yes		Falcon Six
6		S									Falcon 12-D-22
6	1	S									Ferris 60
6	1	S									Ferris 70
6	1	S		Sgl.&Dbl.	18–21		2			8⅛	Ford T
											Fox
12	2	GM	10	Double	21	4	2	2	Yes	9	Franklin 9-B
											Frontenac
6	1	S	5, 20	Single	21		2	2	No	8⅝	Gardner R.T.S.
6	1	S	10, 15	Sgl.&Dbl.	21	2	2	2	No	8⅝	Grant
6	1										Goodspeed
	1	S									H.C.S. Ser. 3
	2	GI	20	Single	23	2	2	2	No	8¼	Handley-Knight B
6	1	S									Hanson 60
6	1	S		Single	17	4	2	4	No	8½	Hatfield A-42
6	1	GI	5	Single	21	2	2	2	No	8⅞	Haynes 75
6	1	GI	5	Single	21	2	2	2	No	8⅞	Haynes 55
12	1	GM	10	Single	21		2	2	No	9¼	Holmes Ser. 4
6	1	S	5, 10	Single	21	2	2	2	No	9 1/16	Hudson, Super-Six
6	1	S	5, 10	Single	15		2	2	No	8⅛	Hupmobile R
6											Jackson 6-38
6	1	S		Single	21		2	2	No	8¾	Jordan M.X.
6	1	S		Single	21		2	2	Yes	8¾	Jordan F
6	1	S	5, 10, 25	Single	18	2	2	2	No	8½	King K
6	1	S	20	Sgl.&Dbl.	21	4	2		Yes	8	Kissel 45
6	1	S	5, 10, 15	Sgl.&Dbl.	18		2	2	No	8¾	Kline Kar 6-55-K
	1	S	5, 20	Single			2	2	Yes	9¾	Kurtz, Automatic A
6	1	GM		Single	21	4	2	2	Yes	9⅛	Lafayette 134
	1										Leach 999
6	1	S	5, 15	Sgl.&Dbl.	21	4	2	2	No	8⅛	Lexington T-22
6	1	S	5, 15	Sgl.&Dbl.	21	4	2		No	8⅛	Lexington ST-22
6	2	S	5	Sgl.&Dbl.	15	2	2	2	No	9	Liberty 10-D
6	1	GM									Lincoln

Auto- Lite; *G. & D.*, Gray & Davis; *Leece-N.*, Leece-Neville; *West*, Westinghouse; *Sim-A.-L.*, Simms & Auto-Lite; Battery: *Prest-O-L.*, Prest-O-Lite; Wiring system: *G. I.* Generator & Ignition combined; *G. I. M.*, Generator, Ignition & Motor combined; *S.*, Generator, Motor Ignition Separate; *G. M.*, Generator & Motor combined; Base Contact: *Sgl. & Dbl.* ,Single & Double.

Specifications of Electrical Equipment Found on 1922 Passenger Cars

MAKE AND MODEL	IGNITION						GENERATOR		Motor	Battery	Amp. Hr.
	System	Make	Control	Breaker point opening	Spark lever retarded	Spark plug thread length	Make	Charging rate at m. p. h.	Make	Make	
Locomobile 48	Double	Berling	Hand	.018		13/16	West	7–25	West	Exide	120
Maibohm B	Single*	At-K	Hand	.005	10°	7/8	Bijur	14–25	Bijur	Willard	94
Marmon 34		Delco	H&A	.018		9/16	Delco	12–25	Delco	Willard	162
Maxwell									Sim-A-L	Prest-O-L	
McFarlan T.V.		West	Hand	.012	5°	3/4	West	15–20	West	Willard	135
Mercer Ser. 5	Single	Eisemann	Hand				West		West	Prest-O-L	149
Merit BC	Closed	Delco	Hand	.023		1/2	Delco	10–25	Delco	Willard	
Meteor 22-80	Single		Hand			7/8	West	15–20	West	Exide	
Mitchell F-50	Single	Remy	Hand	.022		15/32	Remy		Remy	Willard	113
Mitchell F-50	Single	Remy	Hand	.022		15/32	Remy		Remy	Willard	113
Monroe S-9-10-11-12	Single	Conn	Hand	.015	0°	1	A-L	2½–15	A-L	USL	84
Moon 6-48	Single*	Delco	Auto	.025		7/8	Delco	12–25	Delco	Exide	110
Moon 6-75	Single*	Delco	Auto				Delco	12–25	Delco	Exide	130
Murray-Mac 70-T		Dixie	Hand				Bijur	10–15	Bijur	Willard	150
Nash 681-7		Wagner	H&A				Wagner				
Nash 682		Wagner	H&A				Wagner				
Nash 41-4		Delco	Hand				Delco				
National Ser. BB	Closed	Delco	Auto	.015	3/4°	9/16	West	10–20	West	Prest-O-L	125
Noma 3C	Single*	Delco	Hand				Delco		Delco	Willard	90
Noma 1D	Open		Hand					10–15		Willard	90
Norwalk 4-30 KS	Open	Delco	Hand	.020		7/8	Dyneto	20–25	Dyneto	Willard	80
Oakland 6-44	Open	Remy	H&A	.020	0°		Remy	10–20	Remy	Prest-O-L	80
Ogren Six	Open	Bosch	Hand	.020		5/8	Bosch	10–20	Bosch	Willard	90
Oldsmobile 43A	Single	Remy	Hand	.016	0°	7/8	A-L	8–15	A-L	Willard	80
Oldsmobile 46	Double	Delco	Auto	.018	3°	7/8	Delco	8–15	Delco	Willard	80
Oldsmobile 47	Double	Delco	Auto	.018	0°	7/8	Delco	8–15	Delco	Willard	80
Overland 4	Single	Hand	Conn				A-L				
Packard Single Six	Single	Delco	H&A	.015		1/2	At-K	9–10	At-K	Willard	100
Packard Twin Six	Single	Delco	H&A	.015		1/2	Bijur	16–12	Bijur	Willard	120
Paige 6-44	Single**	At-K	Hand	.006	12°	1/2	Remy	12–15	Remy	Willard	118
Paige 6-66	Single**	At-K	Hand	.006	12°	1/2	Remy	12–13	Remy	Willard	118
Pan American 6-55	Open	West	Hand	.004		11/16	West	8–10	West	Willard	
Parenti 1922	Single	Remy	Hand				Bijur	15–20	Bijur	USL	80
Paterson 22-6-52	Closed	Delco	Hand	.018		5/8	Delco	10–15	Delco	Willard	80
Peerless, 56 Ser. 7	Closed	At-K	Auto	.015		1/2	A-L	15–20	A-L	Willard	125
Piedmont 4-30	Single*	Delco	Hand				Dyneto	10–20	Dyneto	Willard	90
Piedmont 6-40	Single*	Remy	Hand				Remy	10–20	Remy	Willard	90
Pierce Arrow 33		Delco	H&A			9/16	Delco		Delco	Willard	
Pilot 6-50	Closed	Conn	Hand				Bijur	12–18	Bijur		120
Porter 46		Berling	Hand				West				
Premier 6-D		Delco	Hand	.010	12°	5/8	Delco	16–17	Delco	Willard	123
Premocar 6-40	Open	Wagner	Hand				Wagner		Wagner	Exide	
Raleigh A6-60		Bosch	Hand				Bosch	12–15	Bosch	Willard	120
Ranger A-22-4		West					Bijur		Bijur		
Ranger A-22-6		Philburn					Bijur		Bijur		
R&V, Knight R	Single	Wagner	Hand	.031	15°	9/16	Wagner	9–20	Wagner	Willard	117½
R&V, Knight J	Single	Wagner	Hand	.031	23°	9/16	Wagner	9–20	Wagner	Willard	117½
Reo T-6-B	Single*		Hand	.020			N. E		N. E	Willard	111
ReVere		Bosch	Hand	.031		1/2	West	18–18	West	Willard	120
Rickenbacker A	Closed	A-L	Auto				Simms	10–	Simms	Prest-O-L	106
Roamer 4-75-E		Bosch	Hand				West	12–25	West	Prest-O-L	80
Roamer 6-54-E		Bosch	Hand				Bijur	12–25	Bijur	Prest-O-L	80
Rock Falls 14		Bosch	Hand				West	11–30	West	Exide	167
Rolls-Royce	Double**	Own	Hand	.020	10°		Bijur		Bijur	Exide	90
Romer A-22		Conn	Hand				West	12–15	West	Willard	120
Saxon 125-G	Single**	Wagner	Hand	.025		9/16	Wagner	18–21	Wagner	Prest-O-L	100
Sayres Six	Open	Delco	Hand	.027	10°	7/8	Delco	16–20	Delco	Willard	93
Seneca 50	Single*	A-L	Hand				A-L	10–15	A-L	Prest-O-L	94
Standard Eight 11	Single	Split	Hand		0°	1/2	West	12–15	West	Willard	160
Stanwood A-22	Closed	At-K	Hand	.006		3/4	West	10–20	West	Willard	
Stearns-Knight SKL 4	Closed	At-K	Hand	.025	5°		West	10–25	West	Exide	90
Stephens 90	Open	Conn	Hand	.015	2°	1	A-L	12–20	A-L	USL	112
Stevens-Duryea E	Closed	Berling	Hand				West		West	Vesta	120
Studebaker Light Six			Auto								
Studebaker Special Six			Hand								
Studebaker Big Six			Hand								
Stutz K	Single		Hand			5/8	Remy		Remy	Willard	125
Templar 445		Simms	Hand		0°	1/2	Bijur	12–30	Bijur	Prest-O-L	100
Tulsa E-1-2-3	Double	Conn	Hand				Dyneto	12–25	Dyneto	Exide	90
Velie 58	Closed	At-K	Hand	.006			Bijur	12–15	Bijur	Willard	
Velie 48		At-K	H&A				Bijur				
Velie 34		At-K	H&A				West				
Vogue 6-55	Double**	Conn	Hand				A-L		A-L	Prest-O-L	
Vogue 6-66	Double**	Conn	Hand				A-L		A-L	Prest-O-L	
Westcott A-44	Single*	Delco	H&A	.018	2°		Delco	14–18	Delco	Willard	117
Westcott C-48	Single	Delco	H&A				Delco				
Wills Sainte Claire A-68	Double*	Delco	H&A				Delco	18–25	Delco	Willard	140
Willys-Knight 20	Single	Conn	Hand				A-L				
Winther Six 61	Open	West	Hand	.010	0°	3/4	West	14–20	West	Willard	115
Winton Six 25		Bosch	Hand				Bijur		Bijur		

ABBREVIATIONS: Ignition: *Open **Closed *At-K*, Atwater-Kent; *Conn.*, Connecticut; *West*, Westinghouse; *N. E.*, North East; *Auto*, Automatic; *H. & A.*, Hand & Automatic; *S. A.*, Semi-Automatic; Generator: *A-L.*, Auto-Lite; *G. & D.*, Gray & Davis; *Leece-N.*, Leece-Neville; *N. E.*, North East; *Split*, Splitdorf; Motor: *A.-L.*,

Giving Ignition, Starting, Lighting, Battery and Lamp Data

System Voltage	Wiring System	Units Combined	Fuses	Base Contact	Head-lights	Side-lights	Tail-lights	Dash-lights	Are Dash & Tail Lights in Series	Diameter of Head Light Lens	MAKE AND MODEL
			Amp.		CP.	CP.	CP.	CP.			
6	2	S.	10	Double	21	4	2	2	No	8¾	Locomobile 48
6	1	S.	6	Single	17	4	2	2	Yes		Maibohm B
6	1			Single	27		2	2	No	9⅞	Marmon 34
6											Maxwell
6	1	GI	10, 30	Sgl.&Dbl.	32	2	2	2		9	McFarlan T.V.
6	1	S.	5, 30	Sgl.&Dbl.	20		4	2		9¼	Mercer Ser. 5
	1	S.		Sgl.&Dbl.	21		2	2	Yes	9	Merit BC
	1	S.	5	Single	16	2	2	2	Yes		Meteor 22-80
6	1	S.	10	Sgl.&Dbl.	21	2	2	2		8	Mitchell F-50
6	1	S.	10	Sgl.&Dbl.	21	2	2	2		8	Mitchell F-50
6	1	S.	20	Sgl.&Dbl.	16	4	2	2	No	8¾	Monroe S-9-10-11-12
6	1	S.		Single	21	4	4	4	No	8⅝	Moon 6-48
6	1	S.									Moon 6-75
6	1	S.									Murray-Mac 70-T
6											Nash 681-7
6											Nash 682
6											Nash 41-4
6	1	S.	5	Sgl.&Dbl.	21	4	2	2	No	9¼	National Ser. BB
6	1	S.									Noma 3C
6	1	S.									Noma 1D
6	1	S.		Single	21		2	2	Yes	8⅝	Norwalk 4-30 KS
6	1	S.		Sgl.&Dbl.	15		2	2	No		Oakland 6-44
6	1	S.	15	Sgl.&Dbl.	21		2	2	No	10¼	Ogren Six
6	1	GI		Sgl.&Dbl.	21		2	2	No	8⅝	Oldsmobile 43A
6	1	GI		Sgl.&Dbl.	21	2	2	2	No	8⅝	Oldsmobile 46
6	1	S.		Sgl.&Dbl.	21	2	2	2	No	7 15/16	Oldsmobile 47
											Overland 4
6	1	S.		Single	15		2	2		8½	Packard Single Six
6	1	S.	10	Single	24		4	4	No	8½	Packard Twin Six
6	1	S.	5, 20	Sgl.&Dbl.	15	2	2	2	Yes	9⅜	Paige 6-44
6	1	S.	5, 20	Sgl.&Dbl.	15	2	2	2	Yes	8⅞	Paige 6-66
	1	S.	15	Single	21		2	2	Yes	9½	Pan American 6-55
6	2	S.	10	Sgl.&Dbl.	15		2	2	No	8	Parenti 1922
6	1	S.		Sgl.&Dbl.	12	4	2	2	Yes	8½	Paterson 22-6-52
6	1	S.	10	Single	21	4	2	2	No	9⅜	Peerless, 56 Ser. 7
6		S.									Piedmont 4-30
6	1										Piedmont 6-40
6	1	S.		Single	21		4	4			Pierce Arrow 33
6	1	S.									Pilot 6-50
12											Porter 46
6	1	GI		Sgl.&Dbl.	21	2	4	4	No	1½	Premier 6-D
	1	S.									Premocar 6-40
6	1	GM									Raleigh A6-60
											Ranger A-22-4
											Ranger A-22-6
6	1	S.	20	Sgl.&Dbl.	21		2	4	No	9⅝	R&V, Knight R
6	1	S.	20	Sgl.&Dbl.	21		2	4	No	9⅝	R&V, Knight J
6	1	S.	5	Single	21	2	2	2	No	9¾	Reo T-6-B
6	1	S.	6, 8	Sgl.&Dbl.	16	8	3	3	No		ReVere
6	1	S.									Rickenbacker A
6	1	S.									Roamer 4-75-E
6	1	S.									Roamer 6-54-E
6	1	S.	15, 30	Single	15	6	2	2		9⅝	Rock Falls 14
12	2	S.	5, 10	Double					No	11	Rolls-Royce
6	1	S.									Romer A-22
6	1	S.	15	Single	17	2	2	2	No	8¾	Saxon 125-G
6	1	S.		Sgl.&Dbl.	21	6	2	2	Yes	8¾	Sayres Six
6	1	S.		Sgl.&Dbl.	16		2	2			Seneca 50
6	1	S.		Single	20	7	7	4	No	8⅞	Standard Eight 11
6	1	S.	10	Sgl.&Dbl.	21	4	2	2	No	9¼	Stanwood A-22
12	1	S.	20	Single	21		2	2	No	9¼	Stearns-Knight SKL 4
6	1	GI	20	Sgl.&Dbl.	15	2	2	2		9¾	Stephens 90
6	1	S.									Stevens-Duryea E
	1	GM									Studebaker Light Six
	1	GM									Studebaker Special Six
	1	GM									Studebaker Big Six
6	1	S.		Sgl.&Dbl.	21		2	2	No	9½	Stutz K
6	1	S.	20	Sgl.&Dbl.	21	2	2	2	No	9⅝	Templar 445
6	1	GI									Tulsa E-1-2-3
	1	S.	10	Single	21	2	2	4			Velie 58
6											Velie 48
6											Velie 34
	1	S.									Vogue 6-55
	1	S.									Vogue 6-66
6	1	S.		Single	21	4	2	2	No	8¾	Westcott A-44
6											Westcott C-48
6	1	GM									Wills Sainte Claire A-68
6											Willys-Knight 20
6	1	S.	5, 20	Single	24		2	2	No	8¼	Winther Six 61
6											Winton Six 25

Auto- Lite; *G. & D.*, Gray & Davis; *Leece-N.*, Leece-Neville; *West*, Westinghouse; *Sim-A.-L.*, Simms & Auto-Lite; Battery: *Prest-O-L.*, Prest-O-Lite; Wiring system: *G. I.* Generator & Ignition combined; *G. I. M.*, Generator, Ignition & Motor combined; *S.*, Generator, Motor Ignition Separate; *G. M.*, Generator & Motor combined; Base Contact: *Sgl. & Dbl.* ,Single & Double.

Mechanical Specifications of 1922 Motor Trucks

This Tabulation Is Arranged By Load Capacities to Enable Dealers to More Readily Make Comparisons for Sales Purposes

MAKE AND MODEL	CHASSIS			TIRES		ENGINE							ELECTRICAL EQUIPMENT				TRANSMISSION SYSTEM						STEERING GEAR	WHEELS
				SIZE									IGNITION		STARTING	LIGHTING	CLUTCH	GEARSET		REAR AXLE				
	Tons Capacity	Price	Standard Wheelbase, Inches	Front	Rear	Make	Number of Cylinders	Bore and Stroke	S. A. E. Hp.	Water Circulation	CARBURETER Make	Truck M. P. H.	Current Source	Make	Make	Make	Make	Make	Forward Speeds	Make	Gear Reduction	Final Drive	Make	Make
½-Ton																								
Dodge Bro.	½	$885	114	32x4p	32x4p	own	4	3 7/8x4½	24.0	pu	Stw	....	bat	N.E.	N.E.	N.E.	own	own	3	own	4	sb	own	Kel
Dort 102-109	½	685	105½	31x4p	31x4p	Lyc	4	3½x5	19.6	t	Car	45.0	bat	Con.	Bos.	Bos.	own	own	3	Flint	4	sb	Jac	Imp
Seneca M	½	1,020	108	30x3½p	30x3½p	LeR	4	3½x4½	19.6	t	Stm	42.0		Con.			B&B	War	3			sb	Gem	Day
Vim 29	½	1,050	108	31x4p	31x4p	own	4	3½x4½	15.6	t	Zen	33.0	bat	Will	West	Wes	B&B		3		5	w		
Vim 30	½	1,175	127	32x4½p	32x4½p	own	4	3½x4½	15.6	t	Zen	33.0	bat	Will	West	Wes	B&B		3		5	w		
¾-Ton																								
Acme G	¾		130	35x5p	35x5p	Cont	4	3¾x5	22.5	t	Ray	28.0	mag	Eis		Eis	B&B	Cotta	3	Tim	6	w	Ros	Bim
Chevrolet G	¾		120	31x4p	34x4½p	own	4	3 11/16x4	24.0	pu	Zen		bat	Rem	Au-L	Au-L	own	own	3	Cen	5	sb	own	Hay
Commerce T	¾	1,450	127	34x4½p	34x4½p	Cont	4	3¾x5	22.5	t	Zen	40.0	mag	Eis	Bijur	Bijur	Det	Det	3	Sal	5	sb	Jac	
Clydesdale 18	¾	1,890	136	34x5p	34x5p	Cont	4	3¾x5	22.5	t	Zen	33.0	mag	Eis	Bijur	Eis	B-L	B-L		Tim	5	w	Ros	Smi
Denby 31	¾	1,625	130	35x5p	35x5p	Cont	4	3½x5	19.6	t	Stm	35.0	mag	Eis	Remy	Rem	Full	Full	3	Col	5	sb	Ros	MWC
International S	¾	1,500	124½	34x5p	34x5p	Lyc	4	3½x5	19.6	t	Ens	35.0	bat	Con	Au-L	Au-L	Mun	Mun	3	Tor	6	i	CAS	own
Ranier R-21	¾	1,990	125	35x5p	35x5p	Cont	4	3½x5	19.6	t	Zen		mag	Opt	Opt	Opt	B-L	B-L	3	Tim	6	w	Lav	Jon
Republic 75	¾	1,250	124	32x4½p	32x4½p	Lyc	4	3½x5	19.6	t	Stm	35.0	bat	Aul	Aul	Aul	own	own	3	Tor	5	i	Jac	MWC
Stoughton C	¾	1,240	131	34x4½p	34x4½p		4	3½x5	19.6	t	Stm		bat	Wes	Wes	Wes			3	Col	5	sb		
White 15	¾	2,400	133½	34x5p	34x5p	own	4	3 3/8x5½	22.5	pu	own		mag				own	own	4	own		sb	own	own
White 15-45	¾	3,200	143½	34x5p	34x5p	own	4	4¼x5¾	28.9	pu	own		mag				own	own		own		sb	own	own
1-Ton																								
Acme B	1		130	34x3½	34x5	Cont	4	3¾x5	22.5	t	Ray	23.0	mag	Eis	G&D	Eis	B&B	Cot	3	Tim	7	w	Ros	Bim
Armleder 20	1		148	**34x3½	**34x5	Bud	4	3¾x5¼	22.5	pu	Zen	19.0	mag	Bos	Wes	Wes	Ful	Ful	3	Tim	7	w	Ros	StM
Atlas MD	1	1,185	130	32x4½p	32x4½p	Lyc	4	3½x5	19.6		Mar		mag	A-K	Bij		B&B	own	3	own		w	CAS	E&O
Avery	1		129	34x5p	34x5p	own	4	3x4	14.4	t	Stm	20.0		KW	Wes		own			Tor		i	Ros	own
Bessemer G	1	1,395	124	*34x3	*34x4	Cont	4	3½x5	19.6	t	Stm		mag	Bos	Bij	Bij	Ful	Ful	3	Tor	7	i	Ros	Sch
Brockway E	1		135	35x5p	35x5p	Bud	4	3¾x5 3/8	22.5	t	Stm		mag	Rem	Rem	Rem	War	War	3	Col	5	sb	Lav	
Clydesdale 20	1	2,385	136	34x5p	34x5p	Cont	4	3¾x5	22.5	t	Zen	40.0	mag	Eis	Bij	Eis	B-L	B-L		Tim	6	w	Ros	
Corbitt H-22	1	1,480	130	34x3½	34x4	Cont	4	3¾x5	22.5	t	Stm	18.0	mag	Eis	Bij	Bij	B-L	B-L	3	Shl	5	w	Ros	Bim
Dearborn E	1	1,600	132	35x5p	35x5p	Bud	4	3 5/8x5½	21.0	pu	Str	45.0	bat	Con	Wes	Wes	Ful	Ful	3	Wis	6	w	Dit	own
Day Elder A	1	1,600	128	35x5p	35x5p	Cont	4	3¾x5	22.5	t	Zen	30.0	mag	Eis	Wes	Eis	Cvt	Mu	3	Shl	6	w	Gem	Jon
Defiance G	1	1,695	128	35x5p	35x5p	High	4	3¾x5	22.5	pu	Stm		mag	Eis	Au-L	Au-L	B&B	GL	3	Eat	5	sb	own	StM
Ford TT	1	445	123	30x3½p	32x4½p	own	4	3¾x4	22.5	t	own		mag	own	own	own	own	own	2	own	7	w	own	own
G.M.C. K-16	1	1,495	132	34x5p	34x5p	own	4	3½x5½	19.6	pu&t	Mar	25.0	mag	Eis	Rem	Rem	own	own	3	own	6	stb	own	Kel
Gary F	1	2,800	130	36x3½	36x4	Bud	4	3¾x5	22.5	t	Mas	20.0	mag	Eis		Opt	Ful	Ful		Tim	7	w	Ros	
Graham Bros.	1	1,370	140	33x4½p	34x5p	Dod	4	3 5/8x4½	24.0	pu	Stw		bat	N.E.	N.E.	N.E.	Dod	Dod	3	own	6	sb	Dod	Kel,Stn
Gramm Bern. 10	1	1,365	129	33x5p	33x5p	Lyc	4	3½x5	19.6	t	Stm	50.0	bat	Con	Au-L	Au-L	B&B	War	3	Sal		sb	Jac-Ros	
Hahn J-4	1		132	34x3½	34x5	Cont	4	3¾x5	22.5	pu	Z&Str			Del		Del	B-L	B-L		Shl		w	Ros	Bm&Sch
International 21	1	1,750	115	36x3½	36x3½	own	4	3½x5¼	19.6	pu	Ens	22.0	mag	Bos		N.E	own	own	3	own	7	i	own	own
Kissel Express	1		140	34x5p	34x5p	own	4	3 7/8x5½	24.0	pu	Stm		bat	Rem	Rem	Rem	War	War	3	Tim	5	w	Jac	StM
Kleiber	1	2,600	140	34x3½	34x5	Cont	4	4½x5¼	27.2	pu	Stm		mag				B-L	B-L	4	Tim	7	w	Ros	San
Larrabee X-2	1	1,925	138	34x5p	34x5p	Cont	6	3¼x4½	25.3	pu	Zen		bat	Bos	Bos	Bos	B-L	B-L	3	Sal	5	w	Gem	Ind
Menominee HT	1	2,080	130	34x3½	36x5	Wis	4	3¾x5	22.5	pu	Stm	18.0	mag	Eis	Bos	Bos	Dtl	Cotta	3	Wis	7	w	Ros	
Napoleon 9	1	1,535	133	35x5p	35x5p	Gray-B.	4	3½x5	19.6	t	Shb	31.2	bat	G&D	G&D	G&D	Ful	Ful	3		6	i	Lav	Roy
Nash 2018	1	1,895	130	34x3	34x4	own	4	3¾x5¼	22.5		Stm	22.0		Eis	Au-L	Au-L	B&B	Det		Cla	6	i	Lav	

ABBREVIATIONS

Types of Construction

*—Tires optional
**—Pneumatics extra
***—Pneumatics and cushions extra
†—Price includes body
bat—storage battery
bs—bevel spur
cu—cushion
i—internal gear
mag—magneto
opt—optional
p—pneumatic
pu—pump
sb—Spiral bevel
stb—straight bevel
t—thermo-syphon
w—worm

MAKERS OF PARTS

A-K—Atwater-Kent
Apo—Apollo
Arc—Archibald
Au-L—Auto-Lite
AuW—Auto Wheel
B&B—Borg & Beck
Bij—Bijur
Bim—Bimel
Ben—Bendix
Ber—Berling
B-L—Brown-Lipe
Bos—Bosch
Bud—Buda
Car—Carter
CAS—CAS Products
Cen—Central
Cla—Clark
Col—Columbia
Con—Connecticut
Cont—Continental
Cot—Cotta
Cvt—Covert
Day—Dayton
Del—Delco
Dela—Delaney
Det—Detroit
Dit—Ditwiler
Dix—Dixie
Dod—Dodge
Dtl—Detlaff
Dun—Dundore
Dur—Durston
Dyn—Dyneto
Eat—Eaton
Eis—Eismann
Ens—Ensign
E&O—Eberly & Oris
Ful—Fuller
GBS—Golden, Belknap & Swartz
G&D—Gray & Davis
Gem—Gemmer
G-L—Grant-Lees
Hay—Haynes
Hels—Hele Shaw
Her—Hercules
Hin—Hinkley
Hoo—Hoopes Bros.
Hrt—Hartford
HS—Herschell-Spillman
Ind—Indestructible
IrM—Iron Mountain
Jac—Jacox
John—Johnson
Jon—Jones
Kel—Kelsey
Kng—Kingston
KW—KW Ignition Co.
Lav—Lavine
LeR—LeRoi
Lib—Liberty
L-N—Leece-Neville
Lyc—Lycoming
Mar—Marvel
Mas—Master
McC—McCanna
M&E—Merchant & Evans
Mid—Midwest
Mon—Monarch
Mun—Muncie
MWC—Motor Wheel Corp.
N.E.—North East
N.—Northern
Pru—Prudden
Ray—Rayfield
Rem—Remy
Ros—Ross
Roy—Royer
Rus—Russel
Sag—Saginaw Products Co.
Sal—Salisbury
Sav—Savage
Sch—Schwartz
Shb—Shebler
Shl—Sheldon
Sim—Simplex
Smi—Smith
Spl—Splitdorf
Stan—Standard Parts Co
StM—St. Mary
Stm—Stromberg
Stw—Stewart
Tea—Teagle
Til—Tillotson
Tim—Timken
Tor—Torbensen
Uni—Universal
Ves—Vesta
Wal—Walker
Wan—Wayne
War—Warner Corp.
Wau—Waukesha
Weld—Weidely
Wes—Westinghouse
Wis—Wisconsin
Woh—Wohlrab
Zen—Zenith

Mechanical Specifications of 1922 Motor Trucks (Cont'd.)

MAKE AND MODEL	CHASSIS			TIRES		ENGINE							ELECTRICAL EQUIPMENT				TRANSMISSION SYSTEM						STEERING GEAR	WHEELS
				SIZE									IGNITION		STARTING	LIGHTING	CLUTCH	GEARSET		REAR AXLE				
	Tons Capacity	Price	Standard Wheelbase, Inches	Front	Rear	Make	Number of Cylinders	Bore and Stroke	S. A. E. Hp.	Water Circulation	CARBURETER Make	Truck M. P. H.	Current Source	Make	Make	Make	Make	Make	Forward Speeds	Make	Gear Reduction	Final Drive	Make	Make
1-Ton CONTINUED																								
Patriot....Revere	1	1,500	128	35x5p	35x5p	Cont...	4	3¾x5	22.5	t.....	Stm.....	....	bat...	A-K...	Bij....	Bij....	B&B...	Cvt....	3	Emp...	6	w....	CAS....	Bim.....
Rainier.....R-19	1	2,150	133	34x3½	34x4d	Cont...	4	3½x5	19.6	t.....	Zen.....	20.0	mag...	Opt....	Opt....	Opt....	B-L....	B-L....	3	Shl....	7	w....	Lav....	Jon.....
Republic.....10	1	1,395	124	34x3	34x4	Cont...	4	3¾x5	22.5	t.....	Stm.....	17.0	mag...	Bos.....	.....	.....	Ful....	Ful....	3	Tor....	6	i.....	Jac.....	MWC.*
Republic....10-E	1	1,695	124	35x5p	35x5p	Cont...	4	3¾x5	22.5	t.....	Stm.....	25.0	mag...	Bos.....	.....	Del....	Ful....	Ful....	3	Tor....	6	i.....	Jac.....	MWC....
Signal.....NF	1	2,227½	132	34x5p	36x6p	Cont...	4	3¾x5	22.5	pu....	Stm.....	25.0	mag...	Eis.....	.....	.....	B-L....	B-L....	3	Tim....	7	w....	Ros.....	StM.....
Stoughton.....A	1	1,995	130	35x5p	35x5p	Wau...	4	3¾x5¼	22.5	pu....	Stm.....	.....	mag...	.....	.....	Dyn...	B-L....	B-L....	3	Shl....	6	w.....	.....	.....
Triangle.....AA	1	1,385	115	34x4½p	34x4½p	H.S....	4	3¼x5	16.9	t.....	Stm.....	40.0	bat....	N.E....	N.E....	N.E....	Ful....	Ful....	3	Cla....	6	i.....	Gem....	Nor.....
Vim.....31	1	1,975	125	35x5*	35x5*	Her....	4	3¾x5½	22.5	pu....	Zen.....	30.0	mag...	Spl....	Wes...	Wes...	Covt...	Covt...	3	.....	6	w.....	.....	.....
Watson.....	1	.....	128	34x5p	34x5p	Bud...	4	3⅝x5⅛	21.0	pu....	Zen.....	35.0	bat....	.....	Dyn...	Dyn...	B-L....	B-L....	.....	.....	.....	sb....	Ros.....	.....
Wichita.....K	1	2,300	144	36x3	36x4	Wau...	4	3¾x5¼	22.5	pu....	Stm.....	13.5	mag...	Eis.....	N.E....	N.E....	own....	B-L....	4	Shl....	7	w....	Ros.....	Bim.....
Wilcox Trux...AA	1	.....	130	36x4	36x4	Bud...	4	3¾x5¼	22.5	pu....	Stm.....	....	mag...	Bos.....	.....	.....	B-L....	B-L....	.....	Shl....	.....	w.....	Gem.....	.....
Winther.....751	¾–1	1,795	135	34x4½p	35x5p	H.S....	4	3½x5	19.6	t.....	Stm.....	30.0	bat....	Wes...	Wes...	Wes...	War....	War....	3	Tor....	6	i.....	Lav.....	MWC....
Wolverine....J-1	1	.....	140	34x3½*	34x5*	Cont...	4	3¾x5	22.5	pu....	Stm.....	18.0	mag...	Eis.....	Bos....	Bos....	Ful....	Ful....	.....	Russ...	8	i.....	Gem....	own.....
1½-Ton																								
Ace.....	1½	2,295	144	34x3½	34x5	Bud...	4	3¾x5⅛	22.5	t.....	Zen.....	18.0	.....	A-K...	Wes...	Wes...	Ful....	Ful....	3	Tim...	7	w....	Ros.....	Sch.....
Acme.....F	1½	.....	141	34x3½	34x5	Cont...	4	3¾x5..	22.5	pu....	Zen.....	18.5	mag...	Eis.....	Day...	Day...	B&B...	Cot....	3	Tim...	8	w....	Ros.....	Bim.....
Akron Multi...20	1¼	1,695	133½	34x5p	34x5p	Hin....	4	4x5¼	25.6	pu....	Stm.....	35.0	bat....	Wes...	Wes...	Wes...	War....	War....	3	Eat....	5	sb....	Jac.....	Bim.....
Atterbury....20R	1½	2,475	144	34x3½	34x5	Cont...	4	3¾x5..	22.5	pu....	Zen.....	20.0	mag...	Ber.....	.....	Bel....	Ful....	Ful....	3	Tim...	7	w....	Ros.....	Arc.....
Available...H1½	1½	2,450	147	36x3½	36x5	Her....	4	4x5½..	25.6	pu....	Stm.....	18.0	mag...	Bos.....	Bos....	Bos....	B-L....	B-L....	3	Tim...	7	w....	Ros.....	StM.....
Bessemer....H-2	1½	1,995	144	36x3½	36x5	Cont...	4	3¾x5	22.5	t.....	Stm.....	.....	mg&bt.	Bos.....	Bij....	Bij....	B&B...	B-L....	3	Tor....	8	i.....	Ros.....	Sch.....
Clydesdale....42	1½	2,475	146	36x3½	36x6	Cont...	4	3¾x5	22.5	t.....	Zen.....	18.0	mag...	Bos.....	Bij....	Eis....	B-L....	B-L....	3	Tim...	7	w....	Ros.....	.....
Commerce....12	1½	1,800	130	35x5*	35x5*	Cont...	4	3¾x5	22.5	t.....	Zen.....	40.0	mag...	Eis.....	Bij....	Bij....	B-L....	B-L....	4	Tor....	8	i.....	Jac.....	.....
Corbitt.....E-22	1½	2,200	144	34x3½	34x5	Cont...	4	3¾x5	22.5	t.....	Stm.....	18.0	mag...	Eis.....	Bij....	Bij....	B-L....	B-L....	3	Shl....	6	w....	Ros.....	Bim.....
Dearborn.....F	1½	2,180	.....	34x4	34x5	Bud...	4	3¾x5½	22.5	t.....	Stm.....	28.0	mag...	.....	.....	V&W...	Ful....	Ful....	.....	Wis....	7	w....	Dit.....	own.....
Defiance.....D	1½	2,095	140	35x5p	36x6p	High...	4	3¾x5..	22.5	pu....	Stm.....	....	mag...	Eis.....	Au-L...	Au-L...	B&B...	GL....	3	Tor....	7	i.....	own.....	StM.....
Denby.....33	1½	2,300	136	35x5p	38x7p	Cont...	4	3¾x5	22.5	t.....	Stm.....	26.5	mag...	Eis.....	Opt....	Opt....	Ful....	Ful....	3	Cla....	6	i.....	Gem....	MWC....
Dependable....C	1½	2,350	150	34x4	34x6	Bud...	4	3¾x5¼	22.5	pu....	Zen.....	18.0	mag...	Spl.....	.....	.....	Ful....	Ful....	3	Wis....	8	w....	Ros.....	Bim.....
Diamond T....03	1–1½	1,975	132	36x3½	36x4	Hin....	4	3¾x5¼	22.5	pu....	Stm.....	28.0	mag...	Bos.....	Opt....	Bos....	Cvt....	Cvt....	3	own....	6	w....	Gem....	Sch.....
Diamond T....FS	1½	2,525	144	36x3½	36x5	Hin....	4	2¾x5¼	22.5	pu....	Stm.....	18.0	mag...	Bos.....	Opt....	Bos....	Cvt....	Cvt....	4	Wis....	8	w....	Gem....	Sch.....
Diamond T.....T	1½	2,250	154	36x3½	36x5	Hin....	4	3¾x5¼	22.5	pu....	Stm.....	20.0	mag...	Bos.....	Opt....	Bos....	Cvt....	Cvt....	3	Tim...	7	w....	Gem....	Sch.....
Federal.....SD	1–1½	1,800	132	35x5p	36x6p	Cont...	4	3¾x5	22.5	pu....	Zen.....	25.0	mag...	Eis.....	Au-L...	Au-L...	B&B...	own....	3	Tim...	7	w....	Gem....	Det.....
G. W. W.....1–1½	1–1½	1,950	142	35x5p	35x5p	Weid...	4	3¾x5½	22.5	pu....	Shb.....	38.0	bat....	Opt....	Opt....	Opt....	Ful....	Ful....	4	Cla....	7	i.....	Woh....	opt.....
Gary.....I	1½	3,250	144	36x3½	36x5	Bud...	4	4x5½	25.6	.....	Mas.....	18.0	.....	.....	.....	.....	Ful....	Ful....	3	Tim...	7	w....	Ros.....	.....
Giant.....15A	1½	2,250	138	34x3½	34x5	Cont...	4	3¾x5	22.5	t.....	Shb.....	15.8	mag...	.....	.....	.....	B-L....	B-L....	3	Shl....	7	w....	Jac.....	Wan.....
Graham Bros....	1½	1,430	140	33x4½p	36x6p	Dodge.	4	3⅞x4½	24.0	pu....	Stw.....	....	bat....	N.E....	N.E....	N.E....	Dod....	Dod....	3	own....	6	sb....	Dod....	Kel-St...
Gramm-B'stein 15	1½	1,900	138	36x3½	36x5	Cont...	4	3¾x5	22.5	t.....	Stm.....	25.0	bat....	N.E....	N.E....	N.E....	Ful....	Ful....	3	Cla....	7	i.....	Ros.....	Bim.....
Indiana.....12	1½	.....	134	34x3½	34x5	Wau...	4	3¾x5¼	22.5	pu....	Stm.....	20.0	mag...	Eis.....	Wes...	Wes...	B&B...	B-L....	3	Shl....	7	w....	Woh....	Bim.....
International...31	1½	1,850	129	36x3½	36x4	own....	4	3½x5¼	19.6	pu....	Ens.....	19.4	mag...	Bos.....	.....	N.E....	own....	own....	3	own....	8	i.....	own.....	own.....
Kalamazoo....G1	1½	.....	144	34x4	34x5	Cont...	4	3¾x5	22.5	t.....	Stm.....	20.0	bat....	Con....	Dyn...	Dyn...	Ful....	Ful....	4	Wis....	8	w....	Ros.....	Bim.....
Kalamazoo....G2	1½	2,800	144	36x4	36x6	Cont...	4	3¾x5	22.5	pu....	Stm.....	20.0	mag...	Bos.....	Dyn...	Dyn...	Ful....	Ful....	4	.....	8	w....	Ros.....	Bim.....
Kelly-S.....K-34	1½	2,900	144	36x3½	36x6	own....	4	3¾x5¼	22.5	pu....	Zen.....	20.0	.....	.....	.....	Eis.....	.....	.....	3	Shl....	8	w....	Gem.....	.....
Kissel, Gen. Util.	1½	.....	152	36x3½	36x5	own....	4	3⅞x5½	24.0	pu....	Stm.....	12.0	mag...	.....	.....	.....	War....	War....	3	Shl....	7	w....	Pru.....	Smi.....
Kleiber.....	1½	3,100	147	36x3½	36x6	Cont...	4	4½x5¼	27.2	pu....	Stm.....	....	mag...	.....	.....	.....	B-L....	B-L....	4	Tim...	7	w....	Ros.....	Smi.....
Koehler.....D	1½	1,985	137	34x3½	34x5	H.S....	4	3½x5	19.6	t.....	Zen.....	18.0	mag...	Spl.....	.....	Wes...	Mech...	Mech...	3	own....	7	w....	Lav.....	Jon.....
Larrabee.....J-4	1½	2,400	138	34x3½	34x5	Cont...	4	3¾x5	22.5	pu....	Zen.....	18.2	mag...	Bos.....	Bos....	Bos....	B-L....	B-L....	3	Shl....	7	w....	Gem....	Hoo.....
Maccar.....L-2	1½	2,700	150	36x4	36x6	Cont...	4	4½x5¼	27.2	pu....	Zen.....	19.0	mag...	Eis.....	.....	Bos....	B-L....	B-L....	4	Tim...	8	w....	Ros.....	Dav.....
Mack...AB Chain	1½	3,000	144	36x4	36x3½d	own....	4	4x5.....	25.6	pu....	shb.....	19.5	mag...	Tea....	L-N...	L-N...	own....	own....	4	own....	6	ch....	own.....	opt.....
Mack.....AB	1½	3,450	144	36x4	36x3½d	own....	4	4x5	25.6	pu....	shb.....	17.9	mag...	Tea....	L-N...	L-N...	own....	own....	4	own....	7	bs....	own.....	opt.....
Master.....JW	1½	2,690	142	34x3½	34x5	Bud...	4	4½x5½	27.2	pu....	own.....	15.3	mag...	.....	.....	.....	Ful....	Ful....	3	Tim...	7	w....	Ros.....	Pru.....
Maxwell.....	1½	932	124	32x3	32x4	own....	4	3⅝x4½	21.0	t.....	.....	25.0	.....	.....	.....	.....	own....	own....	3	own....	7	w....	own.....	.....
Moline.....10	1½	1,985	130	34x5p	36x6p	own....	4	3½x5	19.6	t.....	Til.....	24.0	mag...	Spl.....	Au-L...	Au-L...	B&B...	own....	3	Tor....	8	i.....	Ros.....	MWC....
Napoleon.....11	1½	1,835	133	35x5p	36x6p	Gy.-B.	4	3½x5	19.6	t.....	Shb.....	25.7	bat....	G&D...	G&D...	G&D...	Ful....	Ful....	3	Mid....	7	i.....	Lav.....	Roy.....
Noble.....B30	1½	2,100	156	36x3½	36x5	Bud...	4	3¾x5¼	22.5	pu....	Stm.....	15.8	mag...	Eis.....	Wes...	Wes...	Ful....	Ful....	3	Shl....	8	w.....	Lav.....	Bim.....
Old Hickory...W	1¼	2,175	135	36x3½	36x4	Cont...	4	3¾x5	22.5	t.....	Stm.....	18.0	.....	Eis.....	Ves.....	.....	B&B...	GrL...	3	Tim...	7	w....	Lav.....	Sta.....
Oneida.....B	1½	2,825	144	36x3½**	36x6**	Hin....	4	4x5¼	25.6	pu....	Stm.....	25.0	mag...	Bos.....	Wes...	Wes...	Ful....	Ful....	3	Wis....	7	w....	Ros.....	StM.....
Paige.....52-19	1½	2,880	140	34x3½	34x5	Hin....	4	4x5¼	25.6	pu....	Stm.....	20.0	mag...	Bos.....	Rem...	Rem...	B-L....	B-L....	4	Tim...	7	w....	Ros.....	.....
Rainier.....R-16	1½	2,490	147	34x3½	34x5	Cont...	4	3¾x5	22.5	t.....	Zen.....	18.0	mag...	Opt.....	Opt....	Opt....	B-L....	B-L....	3	Shl....	7	w....	Lav.....	Jon.....
Reo.....F	¾–1¼	1,245	128	34x4½p	34x4½p	own....	4	4½x4½	27.2	pu....	Joh.....	....	bat....	.....	Rem...	Rem...	own....	own....	3	own....	4	sb....	own.....	Pru.....
Republic....11-X	1½	1,795	144	34x3½	34x5	Cont...	4	3¾x5	22.5	t.....	Stm.....	15.0	mag...	.....	.....	.....	Ful....	Ful....	3	Tor....	8	i.....	Jac.....	MWC....
Schwartz.....A	1¼	1,685	130	34x4½p	34x4½p	Lyc....	4	3½x5	19.6	t.....	Car.....	30.0	bat....	Wes...	Wes...	Wes...	Ful....	Ful....	3	Eat....	6	sb....	Ros.....	Sch.....
Selden.....1½-A	1½	2,360	137	34x3½	34x5	Cont...	4	3¾x5	22.5	t.....	Stm.....	18.0	mag...	Eis.....	N.E....	N.E....	B-L....	B-L....	3	Tim...	...	w....	Lav.....	Are.....
Service.....15	1–1½	1,840	132	34x4½p	35x5p	Mid....	4	3½x5	21.0	p.....	Stm.....	.....	bat....	Rem...	Rem...	Rem...	B-L....	B-L....	3	Eat....	.....	sb....	own.....	Det.....
Signal.....H	1½	2,632	144	34x4	36x6	Cont...	4	4½x5¼	27.2	pu....	Stm.....	15.0	mag...	Eis.....	Del....	Del....	B-L....	B-L....	4	Tim...	7	w....	Ros.....	StM.....
Standard.....IK	1½	1,809	134	34x3½	34x5	Cont...	4	3¾x5	22.5	pu....	Stm.....	17.0	.....	.....	.....	.....	B-L....	B-L....	3	Tim...	7	w....	Ros.....	.....
Sterling.....1½	1½	2,885	142	36x3½	36x5	own....	4	4x5¾	25.6	pu....	Zen.....	16.0	bat....	Eis.....	.....	G&D...	B-L....	B-L....	4	Tim...	7	w....	Ros.....	Pru.....
Stoughton.....B	1½	2,350	140	36x3½	36x5	Wau...	4	3¾x5¼	22.5	pu....	Stm.....	....	mag...	.....	.....	Dyn...	B-L....	B-L....	3	Shl....	7	w.....	.....	.....
Tower.....J	1½	2,900	142	35x5p	38x7p	Cont...	4	4½x5¼	27.2	pu....	Opt.....	.....	mag...	.....	.....	.....	Ful....	Ful....	.....	Tim...	7	w....	Ros.....	.....
Traffic..Speedboy	1½	1,595	128	35x5p	35x5p	Cont...	4	3¾x5	22.5	t.....	Car.....	35.0	mag...	Bos.....	G&D...	G&D...	Cvt.....	Cvt.....	3	Rus....	6	i.....	Own....	Day.....
Tiffin.....	1½	2,400	135	36x3½	36x5	Cont...	4	4½x5¼	....	pu....	Shb.....	16	mag...	.....	Wes...	Wes...	Ful....	Ful....	3	Shl....	7	w....	Ros.....	Smi.....
Triangle.....A	1½	2,350	144	34x3½	34x6	Wau...	4	3¾x5¼	22.5	pu....	Stm.....	18.0	mag...	Eis.....	N.E....	Eis....	Ful....	Ful....	3	Cia....	7	i.....	Gem....	N or Ry..
United.....AT	1½	.....	145	34x3½	34x5	Bud...	4	3¾x5¼	22.5	pu....	Stm.....	18.0	mag...	Eis.....	.....	Rem...	Ful....	Ful....	3	Shl....	7	w....	Jac.....	.....
United States...N	1½	1,975	144	36x3½	36x5	Cont...	4	3¾x5	22.5	pu....	Stm.....	19.8	mag...	Bos.....	Bos....	Bos....	Ful....	Ful....	3	Cla....	7	i.....	Lav.....	Sch.....

Mechanical Specifications of 1922 Motor Trucks (Cont'd.)

MAKE AND MODEL	CHASSIS: Tons Capacity	CHASSIS: Price	CHASSIS: Standard Wheelbase, inches	TIRES: SIZE Front	TIRES: SIZE Rear	ENGINE: Make	ENGINE: Number of Cylinders	ENGINE: Bore and Stroke	ENGINE: S. A. E. Hp.	ENGINE: Water Circulation	ENGINE: CARBURETER Make	Truck M. P. H.	ELECTRICAL EQUIPMENT: IGNITION Current Source	ELECTRICAL EQUIPMENT: IGNITION Make	ELECTRICAL EQUIPMENT: STARTING Make	ELECTRICAL EQUIPMENT: LIGHTING Make	TRANSMISSION SYSTEM: CLUTCH Make	TRANSMISSION SYSTEM: GEARSET Make	TRANSMISSION SYSTEM: GEARSET Forward Speeds	TRANSMISSION SYSTEM: REAR AXLE Make	TRANSMISSION SYSTEM: REAR AXLE Gear Reduction	TRANSMISSION SYSTEM: REAR AXLE Final Drive	STEERING GEAR Make	WHEELS Make
1½-Ton CONTINUED																								
Velie 46	1½	1,585	133	36x3½	36x5	Cont	4	3¾x5	22.5	pu	Stm	16.0	mag.bt	Ber	Bij	Bij	B&B	Dur		Tor	8	i	Ros	Mut
Veteran E	1½	3,500	186	34x5p	34x5p	Bud	4	3¾x5¼	22.5	pu	Zen	20.0	mag	Eis			B&B	Cot	3	Shl	6	w	Ros	Smi
Wichita L	1½	2,600	144	36x3½*	36x5*	Wau	4	3¾x5¼	22.5	pu	Stm	12.5	mag	Eis	N.E.	N.E.	own	B-L	4	Shl	8	w	Ros	Bim
Wilson F	1½	2,270	140	36x3½	36x5	own	4	3¾x5		t	Stm	19.6	mag	Eis	Eis	Eis	B&B	Cot	4	Tim	6	w	Ros	
Wilcox Trux B	1½		135	36x4**	36x5**	own	4	4½x5	32.4	pu	Stm		mag				M&E	own	4	Wal		w	own	Smi
Winther 39	1½	2,450	140	34x3½	34x5	Wis	4	3¾x5	22.5	pu	Stm	20.0	mag	Eis	Wes	Eis	Ful	Ful	3	Med	7	i	Lav	Med
Winther 430	1½	2,850	132	32x4	32x4	Wis	4	3¾x5	22.5	pu	Stm	15.0	mag	Eis	Wes	Eis	Ful	Ful	3	Med	9	i	Lav	Med
Wolverine J	1½		140	34x3½*	34x5*	Cont	4	3¾x5	22.5	pu	Stm	18.0	mag		Bos	Bos	Ful	Ful	3	Rus	8	i	Gem	
Autocar 21-F	1½-2	1,950	97	34x4	34x6	own	2	4¾x4½	18.1	pu	Stm		mag				own	own	3	own	8	bs	Ros	
Autocar 21-G	1½-2		120	34x4	34x6	own	2	4¾x4½	18.1	pu	Stm		mag				own	own	3	own	8	bs	Ros	
Autocar 27-H	2	2,950	114	34x5	34x7	own	4	4x5½	25.6	pu	Stm						own	own	4	own	6	bs	Ros	
Autocar 27-K	2	3,075	138	34x5	34x7	own	4	4x5½	25.6	pu	Stm						own	own	4	own	6	bs	Ros	
Brockway S4	1½-2		140	36x3½	36x5	Cont	4	3¾x5	22.5	pu	Stm	19.0	mag	Eis	N.E.	N.E.	B-L	B-L	3	Tim	7	w	Gem	Hoo
Brockway SK	1½-2		145	36x4	36x6	Cont	4	4½x5¼	27.2	pu	Stm	22.0	mag	Eis	N.E.	N.E.	B-L	B-L	3	Tim	6	w	Gem	Hoo
Commerce 16	2		137	35x5p	36x6p	Cont	4	3¾x5	22.5	t	Zen	30.0	mag	Eis	Bij	Bij	B-L	B-L	4	Tor	9		Jac	
Corbitt C22	2	2,600	148	36x3½	36x7	Cont	4	4½x5¼	27.2	pu	Stm	16.0	mag	Eis		Eis	B-L	B-L	3	Shl	8	w	Ros	Bim
Day-Elder B	1½-2	2,000	144	34x3½	34x5	Cont	4	3¾x5	22.5	t	Zen	15.0	mag	Eis	Wes	Eis	Cvt	Cvt	3	Shl	8	w	Gem	Jon
2-Ton																								
Defiance E	2	2,275	140	35x5p	38x7p	High	4	3¾x5	22.5	pu	Stm		mag	Eis	Au-L	Au-L	BB	Gr.L	3	Tor	8	i	own	StM
Denby 134	2	2,600	144	36x3½	36x6	Cont	4	3¾x5	22.5	t	Stm	22.5	mag	Eis			Ful	Ful	4	Rus	10	i	Gem	MWC
Diamond T U	2	2,650	160	36x4	36x7	Hin	4	4x5¼	25.6	pu	Stm	16.0	mag	Bos	BijorW	Bos	Cvt	Cvt	4	Tim	7.75	w	Gem	Sch
Duplex A	1½-2	2,775	145	35x5p	38x7p	Hin	4	4x5¼	25.6	pu	Stm	35.0	bat	Wes	Wes	Wes	Cvt	Cvt	3	Shl	6	w	Ros	MWC
Duty 2			134	*	*	Gray-B	4	3½x5	19.6	t	Zen	34.6					Cvt							
Federal TE	1½-2	2,175	144	36x3½	36x5	Cont	4	4½x5¼	27.2	pu	Zen	15.0	mag	Eis	Au-L	Au-L	BB	Det	4	Tim	8	w	Gem	Sch
G. M. C. K-41A	2	2,775		36x4	36x7	own	4	4x5½	25.6	t&pu	Mar	18.0	mag	Eis	Rem	Rem	own	own	7	Tim	7	w	own	own
Giant 16	2	3,050	144	36x4	36x7	Cont	4	4½x5¼	27.2	pu	Shb	13.8	mag				B-L	B-L	3	Tim	9	w	Ros	Wan
Hahn DE	2		158	36x4	36x7	Cont	4	4½x5¼	27.2	pu	Zn&Str			Del	Del	Del	B-L	B-L	3	Tim	9	w	Ros	Sh Bim
Indiana 20	2		150	36x4	36x7	own	4	4½x5½	27.2	pu	Stm	15.0	mag	Eis	Wes	Wes	BB	B-L	4	Shl	7	w	Woh	Day
International 41	2	2,100	129	36x3½	36x5	own	4	3½x5¼	19.6	pu	Ens	17.2	mag	B s		N.E.	own	B-L	4	own	9	i	own	own
Kimball AB	2	3,675	136	36x4	36x7	Wis	4	4x6	25.6	pu	Mas	17.0	mag	Eis	Wes	Wes	B-L	B-L	4	Shl	6	w	Woh	Smi
Kimball AC	2	3,975	158	36x4	36x8	Wis	4	4¼x6	28.9	pu	Mas	17.0	mag	Eis	Wes	Wes	B-L	B-L	4	Shl	7	w	Woh	Smi
Kleiber	2	3,600	156	36x4	36x7	Cont	4	4½x5¼	27.2	pu	Stm		mag				B-L	B-L	4	Tim	8	w	Ros	Smi
Maccar H-A	2	3,100	162	36x4	36x4d	Cont	4	4½x5¼	27.2	pu	Zen	19.5	mag	Eis	Bos	Bos	B-L	B-L	4	Tim	8	w	Ros	Day
Mack AB	2	3,300	144	36x4	36x4d	own	4	4x5	25.6	pu	Shb	19.5	mag	Tea	L-N	L-N	own	own	4	own	6	ch	own	opt
Mack AB	2	3,750	144	36x4	36x4d	own	4	4x5	25.6	pu	Shb	17.9	mag	Tea	L-N	L-N	own	own	4	own	7	bs	own	opt
Maplelеaf AA	2	4,150	144	36x4	36x7	Hin	4	4x5¼	25.6	pu	Stm	18.0	mag	Eis	Wes	Wes	Ful	Ful	4	Shl	8	w	Ros	Dom
Menominee D	2	3,245	144	36x4	36x8	Wis	4	4x6	25.6	pu	Stm	16.5	mag	Eis	Bos	Bos	Dtl	Cot	3	Wis	8	w	Bos	
Nash 2018	2	2,550	144	34x4	34x6	own	4	3¾x5¼	22.5		Stm	17.0	mag	Eis	Au-L	Au-L	BB	Det	4	Cla		i	Lav	
Noble C-40	2	2,675	160	36x4	36x7	Bud	4	4x5½	25.6	pu	Stm	15.0	mag	Eis	Wes	Wes	Ful	Ful	3	Shl	8	w	Lav	Bim
Oshkosh A	2		136	36x6p	36x6p	HS	4	3½x5	19.6	t	Zen	21.0	bat	N.E.	N.E.	N.E.	Bli	Bli	4	own	8	stb	Ros	Roy
Packard EC	2	3,500	144	36x3½	36x6	own	4	4½x5½	28.0	pu	own	15.0	mag	Dix	Bij	Bij	own	own	4	own	7	w	own	own
Packard EX	2	3,575	144	36x6p	40x8p	own	4	4½x5½	28.0		own	27.0	mag	Dix	Bij	Bij	own	own	4	own	8	w	own	own
Patriot Lincoln	2	2,050	140	34x3½	34x5	Hin	4	4x5¼	25.6	pu	Stm		mag	Spl			Cvt	Ful	4	Emp	7	w	Ros	Bim
Pierce Arrow X-5	2	3,200	150	36x4	36x4d	own	4	4x5½	25.6	pu	Stm	18.0	bat	Del	Del	Del	Cvt	Cvt	4	Eat	9	w	Ros	Day
Power F	2		140	36x6p	40x8p	Hin	4	4½x5	28.9	pu	Zen	22.0	mag	Eis	Wes	Wes	Ful	Ful	4	Vul	7	w	Ros	StM
Rainier R-18	2	2,890	147	34x4	34x6	Cont	4	4½x5¼	27.2	pu	Zen	16.0	mag				B-L	B-L	4	Shl	8	w	Ros	Jon
Schacht F	2	3,200	156	36x4	36x7	Bud	4	4½x5½	28.9	pu	Shb	15.0	mag	Bos		Wes	BB	own	4	own	8	w	own	StM
Schwartz B2W	2	2,600	140	34x3½	34x6	Bud	4	3¾x5¼	22.5	pu	Stm	18.0	bat.mg	Bos		G&D	Ful	Ful	4	Shl	8	w	Ros	Sch
Service 31	2		150	36x3½	36x6	Bud	4	4x5½	25.6	pu	Stm		mag	Eis	Wes	Wes	BB	B-L	4	Tim		w	Ros	
Service 36	1½-2		158	36x6p	38x7p	Bud	4	4½x5½	32.4	pu	Stm		mag	Eis	Wes	Wes	BB	B-L	4	Tim		w	Ros	Bim
Sterling	2	3,085	142	36x4	36x6	own	4	4x5¾	25.6	pu	Zen	16.0	bat	Eis		G&D	B-L	B-L	4	Tim	7	w	Ros	Pru
Stoughton D	2	2,800	140½	36x4	36x7	Her	4	4x5½	25.6	pu	Stm		mag			Wes	B-L	B-L	4	Shl	8	w	Ros	
Sullivan E	2		150	36x4	36x7	Bud	4	4½x5½	28.9	pu	Stm		mag	Bos			B-L	B-L	4	Tim	7	w	Ros	Wan
Super Truck 40	2		156	36x6p	40x8p	Wau	4	3¾x5½	22.5	pu	Zen	13.4	mag	Bos			Ful	Ful	3	Wis	8	w	Lav	Pru
Triangle C	2	2,700	147	36x4	36x6	Wau	4	3¾x5¼	22.5	pu	Stm	16.0	mag	Eis	N.E.	Eis	Ful	Ful	3	Cla	9	i	Gem	Nr. Roy
Velie 46	1½-2	1,585	133	36x3½**	36x5**	Cont	4	3¾x5	22.5		Stm	18.0		Ber			BB	Dur	3	Tor	8	i	Ros	Bim
White 20	2	3,250	145½	36x4	36x4d	own	4	3¾x5¼	22.5	pu	own		mag				own	own	4	own		bs	own	own
White 20-45	2	4,050	168	36x4*	36x7*	own	4	4¼x5¾	28.9	pu	own			mag			own	own	4	own		bs	own	own
Wichita M	2	2,800	144	36x3½*	36x6*	Wau	4	3¾x5¼	22.5	pu	Stm	12.5	mag	Eis	N.E.	N.E.	own	B-L	4	Shl	8	w	Ros	Bim
Winther 49	2	3,250	147	34x4	34x4d	Wis	4	4x5	25.6	pu	Stm	17.0	mag	Eis	Wes	Eis	BB	B-L	4	Cla	8	i	Ros	Med
2½-Ton																								
Ace	2½	2,795	156	36x4	36x4d	Bud	4	4¼x5½	28.9	pu	Zen	16.0	mag	Eis	Wes	Wes	Ful	Ful	4	Tim	7	w	Ros	Sch
Acme A	2-2½		148	36x4	36x7	Cont	4	4½x5¼	27.2	pu	Ray	17.5	mag	Eis	Day	Day	BB	Cot	4	Tim	9	w	Ros	Bim
Acme AC	2½		156	36x4	36x7	Cont	4	4½x5½	32.4	pu	Zen	30.0	mag	Eis	Day	Day	BB	Cot	4	Tim	6	w	Ros	Bim
American 25	2½	3,350	158	36x4	36x4d	Wis	4	4x6	25.6	pu	Stm	18.0	mag	Apo		Wes	Dtl	Cot	4	Tho	8.66	w	Ros	Ind
Armleder HW	2½		148	36x4*	36x7*	Bud*	4	4½x5½	27.2	pu	Zen	15.0	mag	Bos	Wes	Wes	B-L	B-L	4	Tim	9	w	Ros	StM
Atterbury 7CX	2½	3,175	153½	34x4	36x4d	Cont	4	4½x5¼	27.2	pu	Zen	15.0		Eis			B-L	B-L	4	Tim	9	w	Gem	Arc
Available H2½	2½	3,160	152	36x4	36x8	Her	4	4x5½	25.6	pu	Stm	16.0	mag	Bos	Bos	Bos	B-L	B-L	4	Tim	8	w	Ros	StM
Bessemer J-2	2½	2,595	158	36x4	36x4d	Cont	4	4½x5¼	27.2	pu	Stm		mag	Eis		Eis	BB	B-L	4	Tor	8	i	Ros	Sch
Clydesdale 65X	2½	3,450		36x4*	36x4d*	Cont	4	4½x5¼	27.2	pu	Zen	17.0	mag	Bos	Bos	Eis	B-L	B-L	4	Tim	8.50	w	Ros	Smi

Mechanical Specifications of 1922 Motor Trucks (Cont'd.)

MAKE AND MODEL	CHASSIS			TIRES		ENGINE							ELECTRICAL EQUIPMENT				TRANSMISSION SYSTEM						STEERING GEAR	WHEELS
				SIZE									IGNITION		STARTING	LIGHTING	CLUTCH	GEARSET		REAR AXLE				
	Tons Capacity	Price	Standard Wheelbase, Inches	Front	Rear	Make	Number of Cylinders	Bore and Stroke	S. A. E. Hp.	Water Circulation	CARBURETER Make	Truck M. P. H.	Current Source	Make	Make	Make	Make	Make	Forward Speeds	Make	Gear Reduction	Final Drive	Make	Make
2½-Ton CONTINUED																								
Clydesdale..65EX	2½	3,475	.....	36x4*	36x4d*	Cont...	4	4½x5½	32.4	pu....	Zen.....	17.0	mag...	Bos....	Bos....	Eis....	B-L.....	B-L.....	4	Tim...	8.50	w.....	Ros.....	Smi.....
Columbia.....G	2½	.....	148	36x4	36x7	Hin....	4	4x5¼	25.6	pu....	Stm.....	14.0	mag...	Dix.....	Wes....	Wes....	M&E....	Cot.....	4	Rus...	9	i.....	own.....	Det.....
Commerce....18	2½	.....	149	36x6p	38x7p	Cont...	4	4⅜x5¼	27.2	pu....	Zen.....	30.0	mag...	Eis....	Bij.....	Eis....	B-L.....	B-L.....	4	Tor.....	9	i.....	Jac.....	.....
Corbitt.....B22	2½	3,000	152	36x4	36x7	Cont...	4	4⅛x5¼	27.2	pu....	Stm.....	16.0	mag...	Eis.....	.....	Eis....	B-L.....	B-L.....	4	Shl....	8	w.....	Ros.....	Bim.....
Day-Elder.....D	2–2½	2,400	144	36x4	36x7	Cont...	4	4½x5¼	27.2	pu....	Zen.....	14.0	.....	Eis....	Wes....	Eis....	Cvt.....	Cvt.....	4	Shl....	8	w.....	Gem.....	Jon.....
Dependable....E	2½	2,950	165	36x4	36x7	Bud....	4	4¼x5½	28.9	pu....	Zen.....	16.0	mag...	Spl.....	.....	.....	Ful.....	Ful.....	4	Wis....	8	w.....	Ros.....	Bim.....
Federal.....UE	2–2½	2,425	156	36x4	36x4d	Cont...	4	4⅛x5¼	27.2	pu....	Zen.....	13.0	mag...	Eis....	Au-L...	Au-L...	BB.....	Det.....	4	Tim...	9	w.....	Gem.....	Sch.....
Gary.....J	2½	4,250	148	36x4	36x7	Bud....	4	4½x5½	32.4	pu....	Mas.....	15.0	mag...	Eis.....	.....	.....	Ful.....	Ful.....	4	Tim...	8	w.....	Ros.....	.....
Hahn.....EE	2½	.....	162	36x4	36x8	Cont...	4	4½x5½	32.4	pu....	St.-Zn...	.....	.....	Del.....	.....	Del....	B-L.....	B-L.....	4	Tim...	7	w.....	Ros.....	Sh,Bim...
Hall.....	2½	3,275	156	36x4	36x4d	Cont...	4	4⅛x5¼	27.2	pu....	Zen.....	22.0	mag...	Bs,Eis.	.....	Eis....	B-L.....	B-L.....	4	Tim...	7	w.....	Gem.....	Smi.....
Indiana.....25	2½	.....	156	36x4	36x8	own....	4	4½x5½	27.2	pu....	Stm.....	15.0	mag...	Eis.....	Wes....	Wes....	B-L.....	B-L.....	4	Shl....	8	w.....	Woh.....	Day.....
Kalamazoo.....H	2½	3,275	160	36x4	36x8	Wis....	4	4x6	25.6	pu....	Stm.....	15.0	mag...	Bos.....	Dyn....	Dyn....	Ful.....	Ful.....	4	Shl....	8	w.....	Ros.....	Smi.....
Kelly-S.....K-38	2½	3,250	150	36x4	36x4d	own....	4	3¾x5¼	22.5	pu....	Zen.....	16.0	.....	.....	.....	Eis.....	.....	.....	3	Shl....	8	w.....	Gem.....	.....
Kissel..Freighter	2½	.....	168	36x4	36x7	own....	4	4½x5½	32.4	pu....	Stm.....	12.0	mag...	.....	.....	.....	War.....	War.....	4	Tim...	8	w.....	Ros.....	BL.....
Kleiber.....2½	2½	3,950	160	36x5	36x8	Cont...	4	4½x5½	32.4	pu....	Stm.....	.....	mag...	.....	.....	.....	B-L.....	B-L.....	4	Tim...	8	w.....	Ros.....	BM.....
Koehler.....M	2½	3,175	165	36x4	36x7	Her....	4	4x5⅛	25.6	pu....	Zen.....	16.0	mag...	Spl.....	.....	Wes....	B-L.....	B-L.....	4	Tim...	9	w.....	Lav.....	.....
Larrabee.....K-4	2½	3,200	158	36x4	36x8	Cont...	4	4⅛x5¼	27.2	pu....	Zen.....	15.0	mag...	Bos.....	Bos.....	Bos.....	B-L.....	B-L.....	4	Shl....	8	w.....	Ros.....	BL.....
Mack..A B Chain	2½	3,400	144	36x4	36x4d	own....	4	4x5	25.6	pu....	Shb.....	19.5	mag...	Tea.....	L-N....	L-N....	own.....	own.....	4	own....	6	ch.....	own.....	AB.....
Mack.....AB	2½	3,850	144	36x4	36x4d	own....	4	4x5	25.6	pu....	Shb.....	14.7	mag...	Tea.....	L-N....	L-N....	own.....	own.....	4	own....	9	BS.....	own.....	AB.....
Master.....W	2½	3,290	144	34x4	36x7	Bud....	4	4¼x5½	28.9	pu....	own.....	13.8	mag...	.....	.....	.....	Ful.....	Ful.....	4	Tim...	8	w.....	Ros.....	BL.....
Master.....D	2½	3,540	144	34x4	36x7	Bud....	4	4¼x5½	28.9	pu....	own.....	13.8	mag...	.....	.....	.....	Ful.....	Ful.....	4	Wal....	8	i.....	Ros.....	BL.....
Moreland....22C	2½	3,500	168	36x4	36x8	Cont...	4	4⅛x5½	32.4	.....	Mas.....	21.0	.....	Spl.....	.....	.....	own.....	own.....	4	Tim.....	.....	w.....	Ros.....	.....
Noble.....D50	2½	2,950	162	36x4	36x8	Bud....	4	4¼x5½	28.9	pu....	Stm.....	15.0	mag...	Eis.....	Wes....	Wes....	Ful.....	Ful.....	4	Shl....	8	w.....	Lav.....	B.....
Oneida.....C	2½	3,200	160	36x4**	36x8**	Hin....	4	4x5¼	25.6	pu....	Stm.....	22.0	mag...	Bos*...	Wes....	Wes....	Ful.....	Ful.....	4	Wis....	8	w.....	Ros.....	BL.....
Oshkosh.....B	2½	.....	146	38x7p	38x7p	Her....	4	4x5⅛	25.6	pu....	Stm.....	21.0	bat....	N.E....	N.E....	N.E....	Bli.....	Bli.....	4	own....	8	stb....	Ros.....	Roy.....
Paige.....54-20	2½	3,400	150	34x4	34x8	Hin....	4	4¼x5½	28.9	pu....	Stm.....	17.0	mag...	Bos.....	Rem....	Rem....	B-L.....	B-L.....	4	Shl....	8	w.....	Ros.....	Day.....
Rainier.....R-20	2½	3,550	165	34x4	34x7	Cont...	4	4⅜x5¼	27.2	pu....	Zen.....	16.0	mag...	.....	.....	.....	B-L.....	B-L.....	4	Tim...	8	w.....	Ros.....	Jon.....
Sanford....W125	2½	3,350	174	36x4	36x4d	Cont...	4	4⅛x5¼	27.2	pu....	Stm.....	15.0	mag...	Eis.....	.....	.....	BB.....	B-L.....	4	Shl....	8	w.....	Ros.....	Hoo.....
Selden.....2½-A	2½	†3,425	145	36x4	36x7	Cont...	4	4¼x5½	27.2	pu....	Stm.....	16.0	mag...	Eis.....	N.E....	N.E....	B-L.....	B.L.....	4	Tim.....	.....	w.....	Gem.....	Stan.....
Service.....51	2½	.....	160	36x4	36x7	Bud....	4	4¼x5½	28.9	pu....	Stm.....	.....	mag...	Eis.....	Wes....	Wes....	BB.....	B-L.....	4	Tim.....	.....	w.....	Ros.....	Bim.....
Standard.....76	2½	2,800	140	36x4	36x7	Cont...	4	4⅛x5¼	27.2	pu....	Stm.....	15.0	.....	.....	.....	.....	B-L.....	B-L.....	4	Tim...	8	w.....	Ros.....	.....
Sterling.....2½	2½	3,290	156	36x4	36x4d	own....	4	4⅜x5¾	30.6	pu....	Zen.....	15.0	bat....	Eis.....	.....	G&D....	B-L.....	B-L.....	4	Tim...	7	w.....	Ros.....	Pru.....
Super Truck...50	2½	3,300	156	36x4	36x8	Wis....	4	4x6	25.6	pu....	Zen.....	12.2	mag...	.....	.....	Ves....	Ful.....	Ful.....	4	Shl....	8	w.....	Lav.....	Pru.....
Tiffin.....MW	2½	3,100	148	36x4	36x3½	Cont...	4	4⅛x5¼	.....	pu....	Shb.....	14	mag...	.....	Wes....	Wes....	Ful.....	Ful.....	4	Shl....	8	w.....	Ros.....	Smi.....
Tower.....H	2½	3,200	146	36x4	36x8	Cont...	4	4⅛x5¼	27.2	pu....	Stm.....	15.0	.....	Eis.....	.....	.....	Ful.....	Ful.....	.....	Tim.....	.....	w.....	Ros.....	.....
Triangle.....B	2½	2,950	150	36x4	36x7	Wau....	4	4x5¾	25.6	pu....	Stm.....	16.0	mag...	Eis.....	.....	Spl.....	Ful.....	Ful.....	4	Cla.....	9	i.....	Gem.....	Nr, Roy..
Union.....FW	2½	.....	155	36x5	36x8	Wis....	4	4x6	25.6	pu....	Shb.....	15.0	mag...	Eis.....	L-N....	L-N....	Ful.....	Ful.....	4	Wal....	7	BS.....	Ros.....	Wal, Pr.
United.....BT	2½	.....	171	36x4	36x7	Bud....	4	4¼x5½	28.9	pu....	Stm.....	15.0	mag...	Eis.....	.....	Rem....	Ful.....	Ful.....	4	Shl....	8	w.....	Lav.....	.....
Veteran.....A	2½	4,000	156	36x4	36x7	Bud....	4	4¼x5½	28.9	pu....	Zen.....	18.0	mag...	Eis.....	.....	.....	BB.....	Cot.....	4	Shl....	6	w.....	Ros.....	Smi.....
Veteran.....D	2–2½	4,400	156	36x4	36x7	Bud....	4	4¼x5½	28.9	pu....	Zen.....	18.0	mag...	Eis.....	.....	.....	BB.....	Cot.....	4	Shl....	7	w.....	Ros.....	Smi.....
Wichita.....R	2½	3,000	144	36x4**	36x7**	Wau....	4	4¾x5¼	22.5	pu....	Stm.....	12.0	mag...	Eis.....	N.E....	N.E....	own.....	B-L.....	4	Shl....	10	w.....	Ros.....	Day.....
Wichita.....RX	2½	3,600	160	36x4**	36x8**	Wau....	4	4⅜x5¾	30.6	pu....	Stm.....	12.0	mag...	Eis.....	N.E....	N.E....	Hrt.....	B-L.....	4	Shl....	8	w.....	Ros.....	Day.....
Wilcox Trux.....C	2½	.....	150	36x4**	36x3½d*	own....	4	4¼x5	28.9	pu....	Stm.....	.....	.....	.....	.....	.....	M&E.....	own.....	.....	Wal.....	.....	w.....	own.....	Smi.....
Wilson.....EA	2½	2,825	152	36x4	36x7	own....	4	4½x5½	.....	pu....	Stm.....	15	mag...	.....	Eis....	Eis....	BB.....	Cot.....	4	Tim...	7	w.....	Ros.....	.....
Winther.....50	2½	3,995	110	36x6p	42x9p	Wis....	4	4x6	25.6	pu....	Mas.....	18.0	mag...	Eis.....	Wes....	Wes....	Ful.....	B-L.....	4	Cla.....	8	i.....	Ros.....	own.....
Winther.....450	2½	3,690	150	34x5	36x6	Wis....	4	4x5	25.6	pu....	Stm.....	13.0	mag...	Eis.....	Wes....	Eis....	Ful.....	Ful.....	3	Cla.....	12	i.....	Lav.....	Med.....
3½-Ton																								
Acme.....C	3½	.....	168	36x5	40x5d	Cont...	4	4½x5½	32.4	pu....	Zen.....	13.5	mag...	Eis.....	Day....	Day....	BB.....	Cot.....	4	Tim...	10	w.....	Ros.....	Bim.....
American.....40	4	4,275	158	36x5	36x5d	Wis....	4	4½x6	32.4	pu....	Stm.....	15.0	mag...	Apo.....	.....	Wes....	Dtl.....	Cot.....	4	Wis....	10	w.....	Lav.....	Ind.....
Armleder....KW	3½	.....	156	36x5***	36x5d***	Bud*...	4	4½x6	32.4	pu....	Zen.....	12.0	mag...	Bos.....	Wes....	Wes....	B-L.....	B-L.....	4	Tim...	10	w.....	Ros.....	St M.....
Atterbury....7DX	3½	3,975	167½	36x5	40x5d	Cont...	4	4½x5½	32.4	pu....	Zen.....	14.0	.....	Eis.....	.....	.....	B-L	B-L	4	Tim...	10	w.....	Gem.....	Arc.....
Available...H3½	3½	4,175	176	36x5	40x5d	Her....	4	4½x5½	32.4	pu....	Stm.....	14.0	mag...	Bos.....	Bos.....	Bos.....	B-L.....	B-L.....	4	Tim...	10	w.....	Ros.....	StM.....
Bessemer....K-2	4	3,495	175	36x5	36x5d	Cont...	4	4½x5½	32.4	pu....	Stm.....	.....	.....	.....	.....	.....	BB.....	B-L.....	4	Tor.....	10	i.....	Ros.....	Smi.....
Brockway....RT2	3¼–4	.....	175	36x5	36x10	Cont...	4	4½x5½	32.4	pu....	Stm.....	20.0	mag...	Eis.....	N.E....	N.E....	B-L.....	B-L.....	4	Tim...	6	w.....	Gem.....	Smi.....
Brockway....R4	3½	.....	164	36x5	36x10	Cont...	4	4½x5½	32.4	pu....	Stm.....	14.5	mag...	Eis.....	N.E....	N.E....	B-L.....	B-L.....	4	Tim...	7	w.....	Gem.....	Smi.....
Brockway...KR2	3	.....	160	36x4	36x8	Cont...	4	4⅜x5½	27.2	pu....	Stm.....	21.0	mag...	Eis.....	N.E....	N.E....	B-L.....	B-L.....	4	Tim...	6	w.....	Gem.....	Hoo.....
Brockway....K5	2½–3	.....	153	36x4	36x8	Cont...	4	4⅜x5¼	27.2	pu....	Stm.....	18 0	mag...	Eis.....	N.E....	N.E....	B-L.....	B-L.....	4	Tim...	7	w.....	Gem.....	Hoo.....
Clydesdale.....90	3½	4,125	170	36x5	40x5d	Cont...	4	4½x5½	32.4	pu....	Zen.....	16.0	mag...	Bos.....	Bos.....	Eis.....	B-L.....	B-L.....	4	Tim...	10	w.....	Ros.....	Smi.....
Corbitt.....R-22	3	3,200	158	36x4	36x8	Cont...	4	4½x5½	32.4	pu....	Stm.....	15.0	mag...	Eis.....	.....	Eis.....	B-L.....	B-L.....	4	Shl....	8	w.....	Ros.....	Bim.....
Corbitt.....A-22	3¼–4	3,800	178	36x5	36x10	Cont...	4	4½x5½	32.4	pu....	Stm.....	14.0	mag...	Eis.....	.....	Eis.....	B-L.....	B-L.....	4	Shl....	11	w.....	Ros.....	Smi.....
Day-Elder.....C	2½–3	2,750	150	36x4	36x7	Bud....	4	4¼x5½	28.9	pu....	Zen.....	14.0	mag...	Eis.....	Wes....	Eis.....	Cvt.....	Cvt.....	4	Shl....	8	w.....	Gem.....	Jon.....
Day-Elder.....F	3½–4	3,150	165	36x5	36x5d	Cont...	4	4½x5½	32.4	pu....	Zen.....	12.0	mag...	Eis.....	.....	Eis.....	B-L.....	B-L.....	4	Shl....	10	w.....	Gem.....	Jon.....
Denby.....25	3	3,300	150	36x4	36x7	Cont...	4	4½x5¼	27.2	.....	Stm.....	27.3	mag...	Eis.....	.....	.....	Ful.....	Ful.....	4	Rus.....	9	i.....	Gem.....	Smi.....
Denby.....27	4	4,200	170	36x5	36x10	Cont...	4	4½x5½	32.4	pu....	Stm.....	32.4	mag...	Eis.....	.....	.....	own.....	War.....	4	Cla.....	10	i.....	Ros.....	Smi.....
Diamond T.....K	3½	3,750	170	36x5	36x5d	Hin....	4	4¾x5½	28.9	pu....	Stm.....	13.0	mag...	Bos.....	Wes....	Bos.....	Cvt.....	Cvt.....	4	Tim.....	8	w.....	Gem.....	Smi.....
Duplex.....E	3½	4,250	130	36x8	36x8	Bud....	4	4¼x5¼	28.9	pu....	Shb.....	15.0	mag...	.....	.....	.....	B-L.....	B-L.....	4	own.....	8	i.....	Woh.....	MWC.....
F. W. D.....B	3	4,200	124	36x6	36x6	Wis....	4	4¾x5½	36.1	pu....	Stm.....	16.0	mag...	Ben.....	N.E....	N.E....	H-S.....	Cot.....	3	own.....	8	stb.....	Ros.....	Sch.....
Federal.....WE	3¼–4	3,150	154	36x5	36x5d	Cont...	4	4½x5½	32.4	pu....	Zen.....	12.0	mag...	Eis.....	.....	.....	BB.....	War.....	4	Tim.....	10	w.....	Gem.....	Smi.....
G. M. C....K-71	3½	3,950	163	36x5	40x5d	own....	4	4½x6	32.4	pu, t..	Mar.....	.....	mag...	Eis.....	Rem....	Rem....	own.....	own.....	7	Tim.....	8	w.....	own.....	own.....
Gary.....K	3½	5,250	162	36x5	40x5d	Bud....	4	4½x6	32.4	pu....	Mas.....	12.0	mag...	.....	.....	.....	B-L.....	B-L.....	4	Tim.....	10	w.....	Ros.....	Smi.....
Giant.....17	3½	.....	176	36x5	36x5d	Cont...	4	4½x5½	32.4	pu....	Stm.....	12.0	mag...	.....	.....	.....	B-L.....	B-L.....	4	Tim.....	10	w.....	Ros.....	Wan.....
Hahn.....F	3½	.....	191	36x5	36x10	Cont...	4	4½x5½	32.4	pu....	Stm.....	.....	mg, bt..	Del.....	Del.....	Del.....	B-L.....	B-L.....	4	Tim.....	10	w.....	Ros.....	Sh, Bm...
Hall.....	3½	.....	144	36x5	36x5d	Cont...	4	4½x5½	32.4	pu....	Zeni.....	18.0	mag...	Eis, Bs.	.....	.....	B-L.....	B-L.....	4	Tim.....	10	w.....	Gem.....	Smi.....
Indiana.....35	3½	.....	160	36x5	36x5d	own....	4	4⅜x5½	30.6	pu....	Stm.....	12.0	mag...	Eis.....	Wes....	Wes....	BB.....	B-L.....	4	Shl.....	.....	w.....	Woh.....	Day.....

Mechanical Specifications of 1922 Motor Trucks (Cont'd.)

MAKE AND MODEL	CHASSIS			TIRES		ENGINE							ELECTRICAL EQUIPMENT				TRANSMISSION SYSTEM						STEERING GEAR	WHEELS
				SIZE									IGNITION		STARTING	LIGHTING	CLUTCH	GEARSET		REAR AXLE				
	Tons Capacity	Price	Standard Wheelbase, Inches	Front	Rear	Make	Number of Cylinders	Bore and Stroke	S. A. E. Hp.	Water Circulation	CARBURETER Make	Truck M. P. H.	Current Source	Make	Make	Make	Make	Make	Forward Speeds	Make	Gear Reduction	Final Drive	Make	Make
3½-Ton CONTINUED																								
International	61	3	2,400	138½	34x4	36x6	own	4	4¼x5	28.9	t	Ens	15.1	mag	Dix		N.E.	own	B-L	4	own	9	i	own	own
Kalamazoo	K	3½	4,000	160	36x5	36x10	Wis	4	4¼x6	28.9	pu	Stm	12.0	mag	Bos	Dyn	Dyn	Ful	Ful	4	Shl	10	w	Ros	Smi
Kelly-Sp'gf'd	K-41	3½	4,200	156	36x5	40x5d	own	4	4½x6½	32.4	pu	Zen	15.4	mag			Eis				Cla	10	i		
Kimball	AK	3	4,500	172	36x5	36x10	Wis	4	4½x6	32.4	pu	Mas	16.0	mag	Spl	Wes	Wes	B-L	B-L	4	Shl	7	w	Woh	Smi
Kimball	AE	4	5,000	164	36x5	40x6d	Wis	4	4¾x6	36.1	pu	Zen		mag	Spl	Wes	Wes	B-L	B-L	4	Shl	8	w	Woh	Smi
Kissel H'vy Duty		3½		168	36x5	36x5d	own	4	4¼x5½	28.9	pu	Stm	12.0	mag				War	War	4	Shl	11	w	Ros	Smi
Kleiber		3½	4,600	167	36x5	36x10	Cont	4	4½x5½	32.4	pu	Stm		mag				B-L	B-L	4	Tim	10	w	Ros	Smi
Koehler	F	3½	4,150	162	36x5	36x5d	Her	4	4½x5½	32.4	pu	Zen	14.0	mag	Spl		Wes	B-L	B-L	4	Tim	10	w	Lav	Dav
Larrabee	L-4	3½	4,000	160	36x5	36x5d	Cont	4	4½x5½	32.4	pu	Zen	13.0	mag	Bos	Bos	Bos	B-L	B-L	4	Shl	10	w	Ros	Smi
Maccar	M-A	4	4,200	186	36x5	36x5d	Cont	4	4¾x6	36.1	pu	Zen	16.5	mag	Eis	Bos	Bos	B-L	B-L	4	Tim	8	w	Ros	Day
Maccar	H-2	3	3,400	162	36x4	36x4d	Cont	4	4½x5½	32.4	pu	Zen	20.5	mag	Eis	Bos	Bos	B-L	B-L	4	Tim	7	w	Ros	Day
Mack	AC	3½	4,950	168	36x5	40x5d	own	4	5x6	40.0	pu	Shb	14.0	mag	Tea	L-N	L-N	own	own	3	own	8	ch	own	opt
Mapleleaf	BB	3	4,775	150	36x4	36x4d	Hin	4	4½x5½	32.4	pu	Stm	16.0	mag	Eis	Wes	Wes	Ful	Ful	4	Shl	8	w	Ros	Dom
Mapleleaf	CC	4	5,570	162	36x5	36x5d	Hin	4	4½x5½	32.4	pp	Stm	12.5	mag	Eis	Wes	Wes	Ful	Ful	4	Shl	10	w	Ros	Dom
Master	A	3½	4,190	158	36x5	40x5d	Bud	4	4½x6	32.4	pu	Mas	11.5	mag				B-L	B-L	4	Tim	10	w	Ros	Smi
Master	E	3½	4,640	158	36x5	40x5d	Bud	4	4½x6	32.4	pu	Mas	11.3	mag				B-L	B-L	4	Wal	10	i	Ros	Cla,Wal
Menominee	G	3½	4,270	160	36x5	36x10	Wis	4	4½x6	32.4	pu	Stm	12.8	mag	Eis	Bos	Bos	Det	Cot	4	Tim	10	w	Ros	Smi
Moreland	22H	3½	4,600	186	36x5	40x5d	Cont	4	4¾x6	36.1		Mas	21.0		Spl			own	own	4	Tim		w	Ros	Smi
Noble	E70	3½	3,800	182	36x5	36x10	Bud	4	4½x6	32.4	pu	Stm	12.0	mag	Eis	Wes	Wes	Ful	War	4	Shl	8	w	Lav	Bim
Oneida	D	3½	4,050	170	36x5	36x10	Hin	4	4½x5½	32.4	pu	Stm	18.0	mag	Wes	Wes	Wes	Ful	Ful	4	Tim	10	w	Ros	Smi
Packard	ED	3	4,100	156	36x5	36x5	own	4	4½x5½	32.4	pu	own	12.0	mag	Dix	Bij	Bij	own	own	4	own	9	w	own	own
Paige	51-18	3½		160	36x5	36x5d	Hin	4	4½x5½	32.4	pu	Stm	15.0	mag	Bos	Rem	Rem	B-L	B-L	4	Tim	10	w	Ros	own
Patriot Wash		3	2,900	156	36x4**	36x7**	Hin	4	4½x5½	32.4	pu	Stm		mag	Spl			Cvt	Cvt	4	Wis	9	w	Ros	Bim
Pierce Arrow	W-2	3½	4,350	162	36x5	36x5d	own	4	4½x6⅜	32.4	pu	Stm	16.0	bat	Del	Del	Del	Cvt	own	4	own	8	w	Ros	Day
Power	C	3½		160	36x5cu	36x10cu	Hin	4	4½x5½	32.4	pu	Zen	14.5	mag	Eis	Wes	Wes	Ful	Ful	4	Wis	10	w	Ros	St.M
Rainier	R-15	3½	4,400	170	36x5	36x5d	Cont	4	4½x5½	32.4	pu	Zen	15.0	mag	Eis			B-L	B-L	4	Tim	10	w	Ros	Jon
Republic	20	3½	3,095	165	36x5	36x10	Cont	4	4½x5½	32.4	pu	Stm	12.0	mag				Ful	Ful		Tor	10	i	Jac	Smi
Sanford	135	3½	4,200	174	36x5	36x5d	Cont	4	4½x5½	32.4	pu	Stm	13.0	mag	Eis			BB	B-L	4	Shl	3	w	Ros	Hoo
Schacht	F	3	3,800	168	36x5	36x5d	Bud	4	4¼x5½	28.9	pu	Shb	15.0	mag	Bos		Wes	BB	own	4	own	9	w	own	StM
Schacht	E	4	4,200	168	36x5	40x6d	Bud	4	4½x6	32.4	pu	Shb	20.0	mag	Bos		Wes	BB	own	8	own	10	w	own	StM
Schwartz	C2W	3	3,200	150	36x4	36x8	Bud	4	4¼x5½	28.9	pu	Stm	16.0	mag	Bos		G&D	Ful	Ful	4	Shl	8	w	Ros	own
Selden	3½A	3½	4,175	162	36x5	36x10	Cont	4	4½x5½	32.4	pu	Stm	14.0	mag	Eis		N.E.	B-L	B-L	4	Tim		w	Gem	Stan
Service	71	3½		171	36x5	36x5d	Bud	4	4¼x5½	28.9	pu	Stm		mag	Eis	Wes	Wes	B-B	B-L	4	Tim	8	w	Ros	Stan
Service	76	3½		171	36x5	36x5d	Bud	4	4½x6	32.4	pu	Stm		mag	Eis	Wes	Wes	B-B	B-L	4	Tim	7	w	Ros	Stan
Signal	M	3½	3,847	168	36x5	40x10	Cont	4	4½x5½	32.4	pu	Stm	12.0	mag	Eis			B-L	B-L	4	Tim	12	w	Ros	StM
Standard	66	4	3,600	160	36x5	36x10	Cont	4	4½x5½	32.4	pu	Stm	12.0					B-L	B-L	4	Tim	10	w	Gem	
Sterling		3½	4,325	162	36x5**	40x5d**	own	4	4½x6¼	32.4	pu	Zen	14.0	bat	Eis		Wes	Hel-S	own	3	Tim	8	w	Ros	Pru
Stoughton	F	3	3,600	158	36x5	36x5d	Her	4	4¼x5½	28.9	pu	Stm		mag			Wes	B-L	B-L	4	Shl	8	w	Ros	
Sullivan	H	3½		156	36x5	36x5d	Bud	4	4½x6	32.4	pu	Stm	14.0	mag				B-L	B-L	4	Tim	10	w	Ros	Wan
Super Truck	70	3½	4,300	164	36x5	40x5d	Wis		4¼x6	28.9	pu	Zen	11.6	mag	Bos		Ves	Ful	Ful	4	Shl	10	w	Ros	Smi
Tower	G	3½	4,100	165	36x5	36x10	Cont	4	4½x5½	32.4	pu	Stm	12.0					Ful	Ful		Tim		w	Ros	
Union	HW	4	4,650	174	36x6	40x12	Wis	4	4½x6	32.4	pu	Shb	15.0	mag	Eis	L-N	L-N	Ful	Ful	4	Wal	11	bs	Ros	Wal,Smi
Tiffin	F35	3½	4,100	160	36x5	40x5	Cont.	4	4½x5½		pu	Stm	14	mag		Wes	Wes	Det	Cot	4	Shl	8	w	Ros	Smi
United	CT	3½		157	36x5	36x5d	Bud	4	4¼x5½	28.9	pu	Stm	13.0	mag	Eis		Rem	Ful	Ful	4	Shl	10	w	Lav	
United States	R	3	3,075	156	36x4	36x4d	Hin	4	4x5¼	25.6	pu	Stm	17.3	mag	Eis	Bos	Bos	B-L	B-L	4	Shl	8	w	Lav	Sch
United States	S	4	3,875	168	36x5	36x5d	Hin	4	4½x5½	32.4	pu	Stm	12.5	mag	Eis	Bos	Bos	B-L	B-L	4	Shl	10	w	Lav	Sch
Veteran	H	3½-4	5,600	156	36x5	36x10	Bud	4	4½x6	32.4	pu	Zen	14.0	mag	Eis			BB	Cot	4	Shl	8	w	Ros	Smi
Vim	23	3	3,950	175	36x5	36x5d	Her	4	4¼x5½	28.9	pu	Zen	14.0	mag	Spl			B-L	B-L	4		7	w		
White	40	3½	4,200	174	36x5	40x5d	own	4	3¾x5¾	22.5	pu	own		mag				own	own	4	own		i	own	own
Wichita	O	3½	4,000	165	36x5	36x5d	Wau	4	4½x6¼	32.4	pu	Stm	9.0	mag	Eis	N.E.	N.E.	Har	B-L	4	Shl	11	w	Ros	Smi
Wilcox Trux	E	3½		162	36x5**	36x5d**	Bud	4	4½x6	32.4	pu	Stm					Wes	M&E	own		Wal		w	own	Smi
Winther	70	3½	4,200	150	36x5	36x5d	Wis	4	4x6	25.6	pu	Mas	15.0	mag	Eis	Wes	Wes	BB	B-L	4	Cla	9	i	Ros	Cla
Wilson	G	3½	3,615	160	36x5	36x5d	own	4	4½x5½		pu	Stm	15.0	mag		Eis	Eis	B&B	Cot	4	Tim	9	W	Ros	
Wolverine	I	3½		186	36x5	36x10	Cont	4	4½x5½	32.4	pu	Stm	12.0	mag	Eis	Bos	Bos	Ful	Ful	4	Cla	10	i	Ros	Cla
5-Ton																								
Acme	E	5		180	36x6	40x6d	Cont	4	4¾x6	36.1	pu	Ray	12.5	mag	Eis		Day	B&B	Cot	4	Tim	11	w	Ros	Smi
American	50	5	4,500	174	36x5	36x5d	Wis	4	4¼x6	32.4	pu	Stm	15.0	mag	Apo		West	Dtl	Cot	4	Thom	10	w	Ros	Ind
Atterbury	8E	5	4,975	167½	36x5	40x6	Cont	4	4¾x6	36.1	pu	Zen	11.0	mag	Eis		Del	B-Li	B-L	4	Tim	11	w	Gem	Sta
Autocar	26-B	5	4,100	156	34x6	36x12	own	4	4¼x5½	28.9	pu	Stm		mag				own	own	4	own	8	bs	Ros	
Autocar	26-Y	5		120	34x6	36x12	own	4	4¼x5½	28.9	pu	Stm		mag				own	own	4	own	8	bs	Ros	
Available	H5	5	5,375	190	36x6	40x12	Her	4	5x6	40.0	pu	Stm	12.0	mag	Bos	Bos	Bos	B-L	B-L	4	Tim	11	w	Ros	Smi
Brockway	T4	5-6		174	36x6	40x6d	Cont	4	4¾x6	36.1	pu	Stm	13.0	mag	Eis	N.E.	N.E.	B-L	B-L	4	Tim	10	w	Gem	Smi
Clydesdale	120B	5	4,500	176	36x6	40x6d	Cont	4	4¾x6	36.1	pu	Stm	14.0	mag	Bos	Wes	Wes	B-L	B-L	4	Tim	11	w	Ros	Smi
Corbitt	AA-22	5	4,500	178	36x6	40x6d	Cont	4	4¾x6	36.1	pu	Stm	12.0	mag	Eis		Eis	DTI	B-L	4	Shl	10	w	Ros	Smi
Day Elder	E	5-6	4,250	162	36x5	40x6d	Bud	4	4½x6	32.4	pu	Zen	10.0	mag	Eis		Eis	B-L	B-L	4	Shl	10	w	Gem	Jon
Denby	210	5	4,500	170	36x6	40x12	Cont	4	4½x5½	32.4	pu	Stm	32.4	mag	Eis			own	War	4	Cla	12	i	Ros	Cla
Diamond-T	EL	5	4,325	180	36x6	40x6d	Hin	4	4½x5½	32.4	pu	Stm	12.0	mag	Bos	Wes	Bos	Cvt	Cvt	4	Tim	11	w	Gem	Smi
Diamond-T	S	5	4,500	180	36x6	40x6d	Lib	4	4¾x6	36.1	pu	Stm	12.0	mag	Bos	Wes	Wes	B-L	B-L	4	Tim	11	w	Gem	Smi
Federal	X-2	5-6	4,500	163	36x6	40x6d	Cont	4	4¾x6	36.1	pu	Zen	12.0	mag	Eis		Au-L	B&B	War	4	Tim	10	w	Gem	Smi
G. M. C.	K-101	5	4,350	167	36x5	40x6d	own	4	4½x6	32.4	pu	Mar	15.0	mag	Eis	Rem	Rem	own	own	7	Tim	10	w	own	own
Gary	M	5	6,200	182	36x5	40x6d	own	4	5½x6½	48.4	pu	Mas	10.0					B-L	B-L	4	Tim	11	w	Ros	Smi
Hall		5	5,100	144	36x5	40x6d	Cont	4	4½x5½	32.4	pu	Zen	15.0	mag	Es,Bs		Eis	B-L	B-L	4	Tim	15	w	Gem	Smi
Hall		5-7	5,100	144	36x5	40x6d	Cont	4	4½x5½	32.4	pu	Zen	15.0	mag	Es,Bs		Eis	B-L	B-L	4	Tim	14	ch	Gem	Smi

Mechanical Specifications of 1922 Motor Trucks (Cont'd.)

MAKE AND MODEL	CHASSIS			TIRES		ENGINE							ELECTRICAL EQUIPMENT				TRANSMISSION SYSTEM						STEERING GEAR	WHEELS
				SIZE									IGNITION		STARTING	LIGHTING	CLUTCH	GEARSET		REAR AXLE				
	Tons Capacity	Price	Standard Wheelbase, Inches	Front	Rear	Make	Number of Cylinders	Bore and Stroke	S. A. E. Hp.	Water Circulation	CARBURETER Make	Truck M. P. H.	Current Source	Make	Make	Make	Make	Make	Forward Speeds	Make	Gear Reduction	Final Drive	Make	Make
5-Ton CONTINUED																								
Indiana.....51	5	.....	170	36x5	40x6d	Wau...	4	5x6¼	40.0	pu...	Stm.....	12.0	mag...	Eis...	Wes...	Wes...	B&B....	B-L....	4	Shl....	10	w.....	Woh....	Smi.....
International..101	5	3,600	160	36x5	40x10	own....	4	4¼x5	28.9	t.....	Ens.....	14.0	mag...	Dix.....	.....	N.E....	own....	B-L....	4	own....	11	i.....	own.....	own.....
Kalamazoo...K-5	5	4,500	160	36x6	36x6d	Wis....	4	4½x6	32.4	pu...	Stm....	12.0	mag...	Bos....	Dyn..	Dyn...	Ful.....	Ful....	4	Shl....	13	w.....	Ros.....	Smi.....
Kelly-S.....K-50	5	4,900	158	36x6	40x6d	own....	4	4½x6½	32.4	pu...	Zen.....	13.6	mag...	.....	.....	Eis....	.....	.....	4	.....	12	ch....	.....	.....
Kelly-S.....K-60	6	5,100	158	36x6	40x7d	own....	4	4½x6½	32.4	pu...	Zen.....	13.6	mag...	.....	.....	Eis....	.....	.....	4	.....	12	ch....	.....	.....
Kimball.....AF	5	.....	164	36x6	40x7d	Wis....	4	5x6	40.0	pu...	Zen.....	12.0	mag...	Spl....	Wes..	Wes...	B-L....	B-L....	4	Shl....	8	w.....	Woh....	Smi.....
Kleiber.....	5	5,300	180	36x6	40x12	Bud...	4	5x6¼	40.0	pu...	Stm.....	.....	mag...	.....	.....	.....	B-L....	B-L....	4	Tim...	11	w.....	Ros.....	Smi.....
Larrabee.....W	5	4,800	185	36x6	40x6d	Cont...	4	4¾x6	36.1	pu...	Zen.....	10.0	mag...	Bos....	.....	Bos....	B-L....	B-L....	4	Shl....	10	w.....	Ros.....	Smi.....
Maccar.....G	5	4,950	186	36x5	40x6d	Cont...	4	4¾x6	36.1	pu...	Zen.....	13.5	mag...	Eis....	Bos....	Bos....	B-L....	B-L....	4	Tim...	10	w.....	Ros.....	Smi.....
MacDonald....A	7	5,750	180	40x7	40x14	Bud...	4	4½x6	32.4	pu...	Stm.....	10.0	mag...	.....	.....	.....	B-L....	B-L....	4	own....	17	opt...	own.....	own.....
Mack...A B Trac	5	3,400	120	36x4	36x4d	own....	4	4x5	25.6	pu...	Shb.....	12.9	mag...	Tea....	L-N...	L-N...	own....	own....	4	own....	10	ch....	own.....	opt.....
Mack.....AC	5	5,500	168	36x6	40x6d	own....	4	5x6	40.0	pu...	Shb.....	13.2	mag...	Tea....	L-N...	L-N...	own....	own....	3	own....	9	ch....	own.....	opt.....
Mack.....AC	6½	5,750	168	36x6	40x12	own....	4	5x6	40.0	pu...	shb.....	11.3	mag...	L-N...	L-N...	L-N...	own....	own....	3	own....	10	ch....	own.....	opt.....
Mack....AC Trac	7	4,950	119	36x5	40x5d	own....	4	5x6	40.0	pu...	Shb.....	11.1	mag...	Tea....	L-N...	L-N...	own....	own....	3	own....	10	ch....	own.....	opt.....
Mack.....AC	7½	6,000	168	36x7	40x7d	own....	4	5x6	40.0	pu...	Shb.....	10.3	mag...	L-N...	L-N...	L-N...	own....	own....	3	own....	11	ch....	own.....	opt.....
Mack....AC Trac	10	5,500	119	36x7	40x6d	own....	4	5x6	40.0	pu...	Shb.....	10.3	mag...	Tea....	L-N...	L-N...	own....	own....	3	own....	11	ch....	own.....	opt.....
Mack....AC Trac	13	5,750	119	36x6	40x12	own....	4	5x6	40.0	pu...	Shb.....	9.2	mag...	L-N...	L-N...	L-N...	own....	own....	3	own....	12	ch....	own.....	opt.....
Mack....AC Trac	15	6,000	119	36x7	40x7d	own....	4	5x6	40.0	pu...	Shb.....	8.4	mag...	L-N...	L-N...	L-N...	own....	own....	3	own....	14	ch....	own.....	opt.....
Mapleleaf....DD	5	6,490	160	36x6	40x6d	Hin....	4	4½x5½	32.4	pu...	Stm....	11.0	mag...	Eis....	Wes...	Wes...	Ful.....	Ful....	4	Shl....	13	w.....	Ros.....	Smi.....
Master.....B	5	5,290	170	36x6	40x6d	Bud...	4	4¾x6½	36.1	pu...	own.....	9.4	mag...	.....	.....	.....	B-L....	B-L....	4	Tim...	11	w.....	Ros.....	Smi.....
Master.....F	5	5,440	170	36x6	40x6d	Bud...	4	4¾x6½	36.1	pu...	own.....	9.5	mag...	.....	.....	.....	B-L....	B-L....	4	Wal...	11	i.....	Ros.....	Wal, Cla
Menominee...J-3	5	5,450	160	36x6	40x12	Wis....	4	4¾x6	36.1	pu...	Stm.....	12.6	mag...	Eis....	Bos...	Bos...	Dtl.....	Cotta..	4	Tim...	11	w.....	Ros.....	Smi.....
Oneida.....E	5	4,725	180	36x5	40x12	Hin....	4	4½x5½	32.4	pu...	Stm.....	11.0	mag...	Bos....	Wes...	Wes...	Ful.....	Ful....	4	Tim...	11	w.....	Ros.....	Smi.....
Packard.....EF	5	4,500	156	36x6	40x6d	own....	4	5x5½	40.0	pu...	own.....	11.0	mag...	Dix....	Bij....	Bij....	own....	own....	4	own....	10	w.....	Ros.....	own.....
Pierce A.....R-10	5	4,850	168	36x5	40x6d	own....	4	4½x6¾	32.4	pu...	Stm.....	14.0	bat....	Del....	Del....	Del....	Cvt.....	own....	4	own....	10	w.....	Ros.....	Day.....
Rainier.....R-17	5	5,100	172 7/16	36x6	40x6d	Cont...	4	4¾x6	36.1	pu...	Zen.....	15.0	mag...	Eis....	.....	.....	B-L....	B-L....	4	Tim...	13	w.....	Ros.....	Smi.....
Sanford.....150	5	5,100	174	36x5	36x6d	Cont...	4	4½x5½	32.4	pu...	Stm.....	11.0	mag...	Eis....	.....	.....	B&B....	B-L....	4	Shl....	4	w.....	Ros.....	Smi.....
Schacht.....E	5	4,400	168	36x6	4x12	Bud...	4	4½x6	32.4	pu...	Shb.....	15.0	mag...	Bos....	.....	Wes..	B&B....	own....	8	own....	14	w.....	own.....	StM.....
Schwartz.....DW	5	.....	170	36x6	36x12	Bud...	4	4½x6	32.4	pu...	Stm.....	14.0	mag...	Bos....	.....	G&D...	Ful.....	Ful....	4	Shl....	10	w.....	Ros.....	Smi.....
Selden.....5-A	5	5,600	164	36x5	40x12	Cont...	4	4¾x6	36.1	pu...	Stm.....	13.0	mag...	Eis....	N.E..	N.E..	Dtl.....	B-L....	4	Tim...	.....	w.....	Gem....	Sta.....
Service.....101	5	.....	171½	36x6	40x6d	Bud...	4	4½x6	32.4	pu...	Stm.....	.....	mag...	Eis....	Wes...	Wes...	B&B....	B-L....	4	Tim...	10	w.....	Ros.....	Sta.....
Signal.....R	5	4,770	180	36x6	40x12	Cont...	4	4¾x6	36.1	pu...	Stm.....	12.0	mag...	Eis....	.....	.....	B-L....	B-L....	4	Tim...	11	w.....	Ros.....	Smi.....
Standard.....5K	5-6	4,400	164	36x6	40x12	Cont...	4	4¾x6	36.1	pu...	Stm.....	10.0	.....	.....	.....	.....	B-L....	B-L....	4	Tim...	11	w.....	Gem....	.....
Sterling.....	5	4,950	168	36x6	40x6d	own....	4	5x6¼	40.0	pu...	Zen.....	14.0	mag...	Eis....	.....	Wes...	Hels....	own....	3	Tim...	8	w.....	Ros.....	Pru.....
Sterling.....	5	5,500	174	36x6	40x5d	own....	4	5x6¼	40.0	pu...	.....	18.0	bat....	Eis....	.....	Wes...	Hels....	own....	6	own....	7	ch....	Ros.....	Smi.....
Sterling.....	7½	6,000	174	36x6	40x7d	own....	4	5x6¼	40.0	pu...	Zen.....	16½	bat....	Eis....	.....	Wes...	Hels....	own....	6	own....	7	ch....	Ros.....	Smi.....
Tiffin.....TU	5	4,800	168	36x6	40x6d	Cont...	4	4¾x6		pu...	Shb.....	12	mag....	.....	Wes...	Wes...	B&B....	Cot....		Shl....	10	w.....	Ros.....	Smi.....
Super Truck..100	5	5,300	164	36x5	40x12	Wis....	4	4¾x6	36.1	pu...	Zen.....	11.6	mag...	.....	.....	Ves...	Ful.....	Ful....	4	Shl....	10	w.....	Ros.....	Smi.....
Union.....JW	6	5,800	167	36x6	40x14	Wis....	4	5x6	40.0	pu...	Kng.....	12.5	mag...	Eis....	L-N...	L-N...	Ful.....	Ful....	4	Wal....	10	bs....	Ros.....	Smi.....
United States..T	6	5,000	172	36x6	40x6d	Bud...	4	4¾x6½	36.1	pu...	Stm.....	11.0	mg,bt.	Eis....	Bos...	Bos...	B-L....	B-L....	4	Shl....	10	w.....	Lav.....	Smi.....
Tiffin.....UN	8	5,000	168	36x6	40x12	Cont...	4	4¾x6		pu...	Shb.....	12	mag....	.....	Wes...	Wes...	B&B....	Cot....	4	Shl....	10	w.....	Ros.....	Smi.....
White.....45	5	4,500	174	36x6	40x6d	own....	4	4¼x5¾	28.9	pu...	own.....	.....	mag...	.....	.....	.....	own....	own....	4	own....	.....	bs....	own.....	own.....
Wichita.....S	5	5,000	165	36x6	40x6d	Wau...	4	4½x6¼	32.4	pu...	Stm.....	8.5	mag...	Eis....	N.E..	N.E..	Hrt.....	Sav....	4	Sav....	14	bs....	Ros.....	own.....
Wilcox.....F	5	.....	162	36x5	40x12	Bud...	4	4¾x6½	36.1	pu...	Stm.....	.....	mag...	.....	.....	.....	M&E....	own....		Wal....	.....	w.....	own.....	Smi.....
Wilson.....H	5	4,520	160	36x6	40x6d	own	4	3¾x6	....	pu...	Stm.....	.....	mag...	.....	Eis....	Eis....	B&B....	Cot.....		Tim...	10	W.....	Ros.....	.....
Winther.....10S	5	5,250	162	36x6	40x6d	Wis....	4	4½x6	32.4	pu...	Mas.....	12.0	mag...	Eis....	Wes...	Wes...	B&B....	B-L....	4	Cla....	12	i.....	Ros.....	Cla.....
Winther.....14C	7	5,900	162	36x6	40x7d	Wis....	4	5x6	40.0	pu...	Mas.....	10.0	mag...	Eis....	Wes...	Wes...	B&B....	B-L....	4	Cla....	12.0	i.....	Ros.....	Cla.....

ABBREVIATIONS

Types of Construction

*—Tires optional
**—Pneumatics extra
***—Pneumatics and cushions extra
†—Price includes body
bat—storage battery
bs—bevel spur
cu—cushion
i—internal gear
mag—magneto
opt—optional
p—pneumatic
pu—pump
sb—Spiral bevel
stb—straight bevel
t—thermo-syphon
w—worm

MAKERS OF PARTS

A-K—Atwater-Kent
Apo—Apollo
Arc—Archibald
Au-L—Auto-Lite
AuW—Auto Wheel
B&B—Borg & Beck
Bij—Bijur
Bim—Bimel
Ben—Bendix
Ber—Berling
B-L—Brown-Lipe
Bos—Bosch
Bud—Buda
Car—Carter
CAS—CAS Products
Cen—Central
Cla—Clark
Col—Columbia
Con—Connecticut
Cont—Continental
Cot—Cotta
Cvt—Covert
Day—Dayton
Del—Delco
Dela—Delaney
Det—Detroit
Dit—Ditwiler
Dix—Dixie
Dod—Dodge
Dtl—Detlaff
Dun—Dundore
Dur—Durston
Dyn—Dyneto
Eat—Eaton
Eis—Eismann
Ens—Ensign
E&O—Eberly & Oris
Ful—Fuller
GBS—Golden, Belknap & Swartz
G&D—Gray & Davis
Gem—Gemmer
G-L—Grant-Lees
Hay—Haynes
Hels—Hele Shaw
Her—Hercules
Hin—Hinkley
Hoo—Hoopes Bros.
Hrt—Hartford
HS—Herschell-Spillman
Ind—Indestructible
IrM—Iron Mountain
Jac—Jacox
John—Johnson
Jon—Jones
Kel—Kelsey
Kng—Kingston
KW—KW Ignition Co.
Lav—Lavine
LeR—LeRoi
Lib—Liberty
L-N—Leece-Neville
Lyc—Lycoming
Mar—Marvel
Mas—Master
McC—McCanna
M&E—Merchant & Evans
Mid—Midwest
Mon—Monarch
Mun—Muncie
MWC—Motor Wheel Corp.
N.E.—North East
N.—Northern
Pru—Prudden
Ray—Rayfield
Rem—Remy
Ros—Ross
Roy—Royer
Rus—Russel
Sag—Saginaw Products Co.
Sal—Salisbury
Sav—Savage
Sch—Schwartz
Shb—Shebler
Shl—Sheldon
Sim—Simplex
Smi—Smith
Spl—Splitdorf
Stan—Standard Parts Co
StM—St. Mary
Stm—Stromberg
Stw—Stewart
Tea—Teagle
Til—Tillotson
Tim—Timken
Tor—Torbensen
Uni—Universal
Ves—Vesta
Wal—Walker
Wan—Wayne
War—Warner Corp.
Wau—Waukesha
Weid—Weidely
Wes—Westinghouse
Wis—Wisconsin
Woh—Wohlrab
Zen—Zenith

DETAILED SPECIFICATIONS

Name and Model	Price	Plow Capacity	Plowing Speed M. P. H.	H. P. Rating	ENGINE Make	No. Cyl. Bore and Stroke	Cylinder Type	R. P. M.	Engine Type	Cylinder Cast	ENGINE Make of Governor	Type of Governor	Weight	Cooling Fluid	Cooling Capacity	Radiator Make	Fluid Circulation	Lubrication System Type	Oil Pump Type	Carbureter Make and Size
All-In-One A	$1,975	2-3	2½	15-30	Weidely	4-4 x5½	I	900	Vert	Block	Weidely	Cent		W	12½	Own	Pump	Hol. C. S.	Piston	Kingston 1¼
Allis-Chalmers		1	2½	6-12	LeRoy	4-3½x4½	L	1000	Vert	Block	LeRoi	Cent		W	3½	Own	Ther	Cir. Spl	Piston	Kingston 1¼
Allis-Chalmers		3	2½	14-27	Midwest	4-4½x5¼	I	1100	Vert	Pairs	Midwest	Cent	905	W	6	Own	Pump	Hol. C. S.	Gear	Kingston 1¼
Allis-Chalmers		3-4	2½	18-30	Own	4-4¾x6½	I	830	Vert	Block	Own	Cent	1580	W	10	Own	Pump	Hol. C. S.	Gear	Kingston 1¼
Allis-Chalmers		4	2½	22-38	Own	4-4¾x6½	I	930	Vert	Block	Own	Cent	1580	W	10	Own	Pump	Hol. C. S.	Gear	Kingston 1¼
Allwork G		3	2½	14-28	Own	4-4¾x6	L	900	Vert	Singly	Own	Cent	1180	W	10	Perfex	Pump		Piston	Kingston 1½
Allwork C		3	2¾	14-28	Own	4-5 x6	L	900	Vert	Singly	Own	Cent	1200	W	12	Perfex	Pump	Hol. C. S.	Gear	Kingston 1½
Andrews Kinkade D	2,400				Climax	4-5 x6½	L	800	Vert	Pairs	Climax	Cent	1175	W	12	Spirex	Pump	Hol. C. S.	Vane	Stromb'g 1½
Appleton	1,500			12-20	Buda	4-4¼x5½	L	1000	Vert	Block	Pickering	Cent	800	W	8	Modine	Pump	Hol. C. S.	Gear	Schebler 1¼
Aro	495	4	2¼	15-30	Climax	1-4½x5		800	Vert	Singly				W	2	S.-J	Ther	Cir. Sp.	Piston	Schebler 1¼
Aultman and Taylor		6	2¼	22-45	Own	4-5 x6½	L	900	Vert	Pairs	Climax	Cent	1100	W	8¾	G. & O	Pump	Hol. C. S.	Vane	Kingston 1½
Aultman and Taylor		8-10	2¼	30-60	Own	4-5½x8	I	600	Hori	Pairs	Own	Cent	2875	W	85	Own	Pump	Mech		Kingston 2
Aultman and Taylor					Own	4-7 x9	I	550	Hori	Pairs	Own	Cent	3790	W	120	Own	Pump	Mech		Kingston 2½
Automotive	1,785	3		12-24	Hercules	4-4 x5½	L	1000		Block	Pierce	Cent	850	W	7½	McC.-T	Pump	Pres	Gear	Kingston
Avery		2-3		8-16	Own	2-5½x6	I	750	Opp	Singly	Own	Cent	925	W	12½	Own	Ther	Cir. Sp	Gear	Kingston 1¼
Avery		3-4		12-20	Own	4-4½x6	I	950	Opp	Block	Own	Cent	1250	W	11	Own	Pump	Mech		Kingston 1¼
Avery		3-4		12-25	Own	2-6½x7	I	700	Opp	Singly	Own	Cent	1350	W	17½	Own	Ther	Cir. Sp	Gear	Kingston 1½
Avery		3-4		14-28	Own	4-4½x7	I	900	Opp	Block	Own	Cent	1620	W	30	Own	Ther	Cir. Sp	Gear	Kingston 1½
Avery		4-5		18-36	Own	4-5½x6	I	750	Opp	Pairs	Own	Cent	2150	W	33	Own	Ther	Cir. Sp	Gear	Kingston 1½
Avery		5-6		25-50	Own	4-6½x7	I	700	Opp	Pairs	Own	Cent	2700	W	55	Own	Ther	Cir. Sp	Gear	Kingston 2
Avery		8-10		45-65	Own	4-7¾x8	I	600	Opp	Pairs	Own	Cent	3300	W	90	Own	Ther	Cir. Sp	Gear	Kingston 2
Avery		2			Own	6-3 x4	I	1250	Vert	Block	Own	Throt	470	W	6¾	Own	Ther	Cir. Sp	Gear	Kingston 1¼
Avery		3	2½		Own	4-4 x5½	I	1000	Vert	Block	Own	Hydro		W			Pump	Hol. C. S.		Kingston
Avery Track Runner																				
Bates		3	2½	15-25	Own	4-4¼x6	I	800	Hori	Block	Own	Cent	975	W	8	Own	Pump	Hol. C. S.	Gear	Own 1½
Bates (Steel Mule) F		3	3½	18-25	Midwest	4-4½x5¼	I	1100	Vert	Pairs	Simplex	Cent	1000	W	6	Perfex	Pump	Hol. C. S.	Gear	Bennett 1¼
Best 30	3,100	4	3½	18-30	Own	4-4¾x6½	I	800	Vert	Singly	Own	Cent	1600	W	9	Own	Pump	Ho.. C. S.	Gear	Ensign 1½
Burn-Oil	1,495	3	4	15-30	Own	2-6¾x7	I	700	Horl	Pairs	Own	Cent		W	16	Eureka	Pump	Mech		Schebler 1½
Case 10-18		2	3	10-18	Own	4-3⅞x5	I	1050	Vert	Block	Own	Cent		W	9	Own	Pump	Hol. C. S.	Piston	Kingston 1½
Case 15-27		3-4	2¼-3	15-27	Own	4-4½x6	I	900	Vert	Block	Own	Cent		W	11	Own	Pump	Hol. C. S.	Piston	Kingston 1½
Case 22-40		4-5	3¼	22-40	Own	4-5½x6¾	I	850	Vert	Pairs	Own	Cent		W	15½	Own	Pump	Mech		Kingston 2
Catterpillar T-11		4	3	25-	Own	4-4¾x6	I	900	Vert	Pairs	Own	Cent	1400	W	7½	Modine	Pump	Hol. C. S.	Gear	Schebler 1½
Catterpillar T-16		6	3	40-	Own	4-6½x7	I	700	Vert	Singly	Own	Cent	2300	W	12	Own	Pump	Hol. C. S.	Gear	Kingston 2
Chase 12-25	1,825	3	2¾	12-25	Buda	4-4½x5½	L	1050	Vert	Block	Pierce	Cent		W	8½		Pump	Hol. C. S.	Gear	Kingston 1½
Cletrac F	795			9-16	Own	4-3¼x4½	L	1600	Vert	Block	Own	Cent		W		McCord	Pump	Cir. Sp	Piston	Tillotson 1
Cletrac W	1,345	2	3½	12-20	Own	4-4 x5½	I	1265	Vert	Block	Own	Cent		W		McCord	Pump	Mech	Gear	Kingston 1¼
Dakota	1,750	3	2¾	15-27	Doman	4-4¾x6	T	800	Vert	Pairs	Doman	Cent	800	W	16	S. & J	Pump	Hol. C. S.	Gear	Linga 1¼
Depue A	2,800	3		20-30	Buda	4-4½x6	L	1000	Vert	Block	Simplex	Cent	950	W	8	Perfex	Pump	Hol. C. S.	Gear	Stromb'g 1½
Emerson-Brant 12-20		3	2.7	12-20	Own	4-4¾x5	L	900	Vert	Pairs	Own	Cent	997	W	7½	Modine	Pump	Cir. Sp	Piston	Stromb'g 1½
Emerson-Brant Q		3	2.26	12-20	Own	4-4¾x5	L	850	Vert	Pairs	Pickering	Cent	1100	W	9	Perfex	Pump	Cir. Sp	Piston	Bennett 1½
Emerson-Brant 16-32		4	2.26	16-32	Own	4-5¾x7	L	750	Vert	Pairs	Pickering	Cent	2000	W	10	Modine	Pump	Cir. Sp	Piston	Stromb'g 1¾
Fageol D		2	2	9-18	Lycom	4-3½x5	L	1200	Vert	Block	Red Devil	Cent		W		Perfex	Pump	Cir. Sp	Piston	Tillotson
Farm Horse B	1,885	4	2.5	18-30	Climax	4-5 x6½	L	850	Vert	Pairs	Climax	Cent	1400	W	10	S. & J	Pump	Mech	Vane	Bennett 1½
Farquhar 15-25		3-4	2	15-25	Buda	4-4½x6	L	1000	Vert	Block	Pierce	Cent	1057	W	12	Perfex	Pump	Hol. C. S.	Gear	Kingston 1¼
Farquhar 4-30		4-5	2.3	18-35	Own	4-6 x8	I	550	Vert	Pairs	Own	Cent		W	94	Own	Pump	Cir. Sp	Gear	Kingston 2
Farquhar 4-40		6-7	2.3	25-50	Own	4-7 x8	I	550	Vert	Pairs	Own	Cent		W	94½	Own	Pump	Cir. Sp		Holley 1¼
Fordson	625	2	2.5	-18	Own	4-4 x5	L	1000	Vert	Block			650	W	12	Own	Ther	Cir. Sp		Kingston 1½
Fox E	3,100	4	2.6	20-40	Own	4-5½x7½	I	650	Hori	Pairs	Own	Cent	2017	W	12	Perfex	Pump	Hol. C. S.		Kingston 1¼
Frick A		2-3	2½	12-20	Erd	4-4 x6	I	900	Vert	Block	Erd	Cent	900	W	7¾	Perfex	Pump	Cir. Sp	Piston	Kingston 1¼
Frick C		3-4	2.1	15-28	Beaver	4-4¾x6	I	900	Vert	Block	Taco	Cent	1000	W	9¾	Perfex	Pump	Hol. C. S.	Gear	Bennett 1½
Gray		4	3	18-36	Wauk	4-4¾x6¾	L	950	Vert	Pairs	Waukesha	Cent	840	W	8		Pump	Cir. Sp	Gear	Bennett 1½
Hart-Parr	945	2	3	-20	Own	2-5¼x6½	I	800	Hori	Pairs	Own	Cent	890	W	7¾	Perfex	Pump	Mech	Piston	Schebler 1¼
Hart-Parr	1,295	3	3	-30	Own	2-6½x7	I	950	Hori	Pairs	Own	Cent	1170	W	10	Perfex	Pump	Mech	Piston	Schebler 1½
Heider D	870	2	2.5	9-16	Wauk	4-4¼x5¾	L	1000	Hori	Pairs	Waukesha	Cent	800	W	9	Perfex	Pump	Cir. Sp	Gear	Kingston 1
Heider C	995	3	2.25	12-20	Wauk	4-4½x6¾	L	900	Hori	Pairs	Waukesha	Cent	900	W	10	Perfex	Pump	Cir. Sp	Gear	Kingston 1¼
Huber	1,185	3	2.5	12-25	Wauk	4-4½x5¾	L	1000	Vert	Pairs	Waukesha	Cent	600	W	8	Perfex	Pump	Cir. Sp	Gear	Kingston 1¼
Huber	1,885	3	3	15-30	Midwest	4-4½x6	I	1000	Vert	Pairs	Taco	Cent	1200	W	11¼	Perfex	Pump	Hol. C. S.	Gear	Kingston 1¼
Illinois C		4	2.5	15-30	Climax	4-5 x6½	L	850	Vert	Pairs	Climax	Cent	1000	W	7	Modine	Pump	Hol. C. S.	Eccentr	Stromb'g 1½
Imperial	5,000	12	2.25	40-70	Own	4-7½x9	I	400	Hori	Singly	Own	Cent	4500	W	45	Own	Pump	Mech	Piston	Kingston 2
Indiana F	895	1	2.5	5-10	LeRoi	4-3½x4½	L	1000	Vert	Block	LeRoi	Cent	335	W	5	Candler	Ther	Cir. Sp	Piston	Kingston 1
International 8-16	900	2	2.75	8-16	Own	4-4¼x5	I	1000	Vert	Block	Own	Cent		W	11		Ther	Cir. Sp	Piston	Ensign
International 15-30		3	3	15-30	Own	4-4½x6	I	1000	Vert	Block	Own	Cent		W			Ther	Cir. Sp	Gear	Ensign
International 15-30		4	2.4	15-30	Own	4-5¼x8	I	575	Hori	Pairs	Own			W	40		Pump	Mech		Own
Klumb		4	2.5	18-32	Climax	4-5 x6½	L	850		Pairs	Own	Cent	1150	W	10	S. & J	Pump	Pres	Vane	Stromberg
Knudson	2,000	4	3	25-45	Own	4-5½x9	I	500	Vert	Singly	Own	Cent	1500	W or O	35	Own	Ther	Cir. Sp	Eccent	Own 1¾
Lauson S	1,495	3	3.25	12-25	Midwest	4-4½x5¼	I	1200	Vert	Pairs	Taco	Cent	950	W	8	Perfex	Pump	Hol. C. S.	Gear	Kingston 1¼
Lauson 15-30	1,985	3-4	2.5	15-30	Beaver	4-4¾x6	I	950	Vert	Block	Taco	Cent	1100	W	12	Perfex	Pump	Hol. C. S.	Gear	Kingston 1½
Leader M		3-4	2.25	16-32	Climax	4-5 x6½	L	800	Vert	Pairs	Climax	Cent	1200	W	12		Pump	Hol. C. S.	Gear	Stromb'g 1½
Leader G-U		3-4	2.25	18-36	Climax	4-5 x6½	L	900	Vert	Pairs	Climax	Cent	1200	W	12		Pump	Cir. Sp	Gear	Stromb'g 1½
Leonard	2,530	3	2.7	20-30	Buda	4-4½x6	L	1000	Vert	Block	Duplex	Cent					Pump	Hol. C. S.	Gear	Zenith 1¼
Linn	5,100	6	2		Wauk	4-5 x6¼	L	1000	Vert	Pairs	Waukesha	Cent	1000	W		McCord	Pump	Cir. Sp	Gear	Schebler 1½
Little Giant B	2,200	4	2.5	16-22	Own	4-4½x5	L	950	Vert	Pairs	Own	Cent	1250	W	9	S. & J	Pump	Cir. Sp	Gear	Kingston 1½
Little Giant A	3,300	6	2.5	26-55	Own	4-5½x6	L	750	Vert	Pairs	Pickering	Cent	1650	W	10	S. & J	Pump	Cir. Sp	Gear	Stromb'g 1¾
Minneapolis	900	3	2.21	12-25	Own	4-4½x7		750		Block	Own	Cent		W	8⅞	Cellulos	Pump	Mech		Kingston 1½
Minneapolis		3-4	2.75	17-30	Own	4-4¾x7		775			Own	Cent		W	8½	S. & J	Pump	Mech		Kingston 1¾
Minneapolis		4-5	2.7	22-44	Own	4-6 x7		700		Pairs	Own	Cent		W	14	S. & J	Pump	Mech		Kingston 2
Minneapolis		8-10	2.1	35-70	Own	4-7¼x9		550		Pairs	Own	Cent		W	60		Pump	Mech		Kingston 2½
Mohawk E	785		2.25	8-16	Light	4-3¼x4½	L	1000	Vert	Block	Pierce	Cent	.365	W	6	Bush	Ther	Cir. Sp	Piston	Kingston 1
Moline D	990	2-3	3.0	9-18	Own	4-3½x5	I	1400	Vert	Block	Remy	Elec	720	W	6	Modine	Ther	Hol. C. S.	Gear	Holley 1¼
Nilson	2,475	4	2.5	20-40	Wauk	4-5 x6¼	L	900	Vert	Pairs	Waukesha	Cent	1000	W	14	S. & J	Pump	Hol. C. S.	Gear	Stromb'g 1½
Oil Pull K	1,485	3	2.1	12-20	Own	2-6 x8	I	560	Hori	Pairs	Own	Cent		O	10½	Own	Pump	Cir. Sp		Own 2¼
Oil Pull H	2,285	4	2.1	16-30	Own	2-7 x8½	I	530	Hori	Pairs	Own	Cent		O	15	Own	Pump	Cir. Sp		Own 2½
Oil Pull G	3,175	6	2.0	20-40	Own	2-8 x10	I	450	Hori	Singly	Own	Cent		O	17	Own	Pump	Cir. Sp		Own 3¼
Oil Pull E	4,590	8-10	1.9	30-60	Own	2-10 x12		375	Hori	Singly	Own	Cent		O	70	Own	Pump	Cir.Sp.Me		Own 3¼
Oshkosh M	650	1	2.5	6-12	Own	2-4 x6	I	1000	Hori	Pairs	Own	Cent	600	W	8	Modine	Pump	H.C.S.Me	Piston	Kingston 1¼
Oshkosh H	985	3	3.0	12-24	Own	2-6 x7	I	900	Hori	Pairs	Own	Cent	900	W	10	Modine	Pump	Hol. C. S.	Piston	Kingston 1¾

ABBREVIATIONS—**B. & B.**—Borg & Beck; **H. B.**—Horizontal Bars; **W.**—Water; **Hol. C. S.**—Hollow crankshaft; **Gr.**—Gravity; **Vac.**—Vacuum; **P.**—Pump; **Brlng.**—Berling; **D. D.**—Dry Disk; **D. O.**—Disk in Oil; **Struct.**—Structural Steel; **Cent.**—Centrifugal; **Cir. Sp.**—Circulating splash; **Rev.**—Revolv-

OF 1922 FARM TRACTORS

Water Injected with Fuel	Fuel Feed	Fuel Tanks and Capacities	Air Cleaner Make	Electrical System: Ignition System Make	CLUTCH: Make	CLUTCH: Type	TRANSMISSION: Make of Transmission	TRANSMISSION: No. Forward Speeds	TRANSMISSION: Final Drive	TRANSMISSION: Differential Lock	TRANSMISSION: Drive Wheel Axle Type	TRANSMISSION: Steering Type	WHEELS: No. Driving Wheel	WHEELS: Diameter and Face	WHEELS: No. of Tracks	WHEELS: No. of Non-drive	FRAME: Material	FRAME: Wheelbase	Total Weight	
.....	Gr....	2-5G-22K.....	Vortex..	Brlng.....	Detlaff.....	D. D....	Americ'n	2	Rim....	No...	Dead...	Fork.....	2	52x 8	....	1	Struct...	94	4800	All-In-One.....A
No...	Gr....	1-8½G.....	Taco.....	.....	B. & B.....	D. D....	Own....	1	Rim....	No...	Dead...	Worm....	2	48x 6	....	2	None...	80	2500	Allis-Chalmers.....
No...	Gr....	1-20G.....	Taco.....	.....	Own.....	Shoe....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	46x12	....	2	None...	78	4400	Allis-Chalmers.....
Yes...	Gr....	1-7¾G-25K...	Taco.....	.....	Own.....	Shoe....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	50x12	....	2	None...	94	6150	Allis-Chalmers.....
No...	Gr....	1-35G.....	Taco.....	.....	Own.....	Shoe....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	50x12	....	2	None...	94	6150	Allis-Chalmers.....
No...	Gr....	2-5G-23K.....	Bennett.	Bosch.....	Own.....	D. D....	Own....	3	Spoke..	.....	Rev....	Knuckle..	2	38x12	....	2	Struct...	75	4800	Allwork.....G
No...	Gr....	2-5G-24K.....	Bennett.	Bosch & K.	Own.....	D. D....	Own....	3	Rim....	No...	Rev....	Knuckle..	2	48x12	....	2	Struct...	80	5200	Allwork.....C
Yes...	Gr....	2-25G-5K.....	Bennett.	Dixie.....	Own.....	D. D....	Own....	2	Spoke..	No...	Dead...	Knuckle..	2	54x14	....	2	Struct...	96	5000	Andrews Kinkade.....D
Yes...	Gr....	2-5G-20K.....	Bennett.	.....	B. & B.....	D. D....	Nuttall..	2	Rim....	No...	Rev....	Knuckle..	2	54x12	....	2	Struct...	96	4900	Appleton.....
.....	Gr....	1-2G.....	Donald'n	Brlng.....	Own.....	.....	.....	1	Axle....	No...	Live....	.....	2	30x 4	....	2	None...	.....	.....	Aro.....
No...	Gr....	2-6G-16K.....	Bennett.	Eisemann.	T. D.....	D. D....	Own....	1	Rim....	No...	Rev....	Knuckle..	2	70x12	....	2	Struct...	98½	8100	Aultman and Taylor....
Yes...	Gr....	2-20G-35K.....	.....	Eisemann.	Own.....	Shoe....	Own....	2	Rim....	No...	Rev....	Swinging..	2	70x20	....	2	Struct...	102	12800	Aultman and Taylor....
Yes...	Gr....	2-20G-60K.....	.....	Eisemann.	Own.....	Shoe....	Own....	1	Rim....	No...	Rev....	Swinging..	2	90x24	....	2	Struct...	136	23400	Aultman and Taylor....
No...	.....	1-18G.....	Bennett.	Eisemann.	B. & B.....	Plate....	Own....	2	Axle....	Yes...	Live....	Power....	2	40x10	....	2	Steel...	70	3950	Automotive.....
Yes...	Gr....	1-2½G-13½K.	Bennett.	.....	Own.....	.....	Own....	2	Spoke..	No...	Rev....	Swinging..	2	50x12	....	2	Struct...	90	4900	Avery.....
Yes...	Gr....	1-6G-16K.....	.....	.....	Own.....	D. D....	Own....	2	Hub....	No...	Rev....	Knuckle..	2	52x14	....	2	Struct...	80	6000	Avery.....
Yes...	Gr....	1-3½G-20K...	Bennett.	.....	Own.....	Shoe....	Own....	2	Spoke..	No...	Rev....	Swinging..	2	56x20	....	2	Struct...	95	7500	Avery.....
.....	Gr....	1-3½G-20K...	Bennett.	.....	Own.....	D. D....	Own....	2	Spoke..	No...	Rev....	Knuckle..	2	60x16	....	2	Struct...	98	7540	Avery.....
Yes...	Gr....	1-5½G-34K...	Bennett.	.....	Own.....	D. D....	Own....	2	Spoke..	Yes...	Rev....	Swinging..	2	65x20	....	2	Struct...	97	9750	Avery.....
Yes...	Gr....	1-5½G-34K...	.....	.....	Own.....	D. D....	Own....	2	Spoke..	No...	Rev....	Swinging..	2	69x20	....	2	Struct...	114	12500	Avery.....
Yes...	Gr....	1-5½G-45K...	.....	.....	Own.....	D. D....	Own....	2	Spoke..	No...	Rev....	Swinging..	2	87½x24	....	2	Struct...	138	22000	Avery.....
No...	Gr....	1-10K.....	Bennett.	.....	Own.....	D. D....	Own....	3	Rim....	No...	Dead...	Knuckle..	2	38x10	....	2	Struct...	90	3164	Avery.....
.....	Gr....	1-30G.....	Opt.....	Dixie.....	Own.....	D. D....	Own....	3	.....	.....	.....	Knuckle..	.....	.....	2	....	.....	.....	5000	Avery Track Runner...
Yes...	Gr....	2-2G-15K.....	Own.....	.....	Own.....	Cont....	Own....	3	Rim....	Yes...	Dead...	Knuckle..	2	54x12	....	2	Struct...	80	4000	Bates.....oo
No...	Gr....	2-5 and 10G..	R. W....	Bosch.....	B. & B.....	D. D....	Own....	2	Axle....	Yes...	Dead...	Knuckle..	.....	.....	2	2	Struct...	80	4850	Bates (Steel Mule)....F
No...	Vac....	2-2¾G-30K...	Pomona.	Brlng.....	Own.....	Plate....	Own....	2	Rim....	.....	Dead...	.....	.....	.....	2	....	None...	.....	7560	Best.....30
No...	Gr....	1-30K.....	Bennett.	.....	Own.....	Cont....	Own....	2	Rim....	No...	Live....	Knuckle..	2	56x12	....	2	Cast....	.....	.....	Burn-Oil.....
No...	Gr....	2-2G-10½K..	Own.....	.....	Own.....	Shoe....	Own....	2	Spoke..	Yes...	Live....	Knuckle..	2	42x 9	....	2	Cast....	65	3820	Case.....10-18
No...	Gr....	2-2¾G-20K...	Own.....	.....	Own & B. & B.	D. D....	Own....	2	Spoke..	Yes...	Live....	Knuckle..	2	52x14	....	2	Cast....	76½	6460	Case.....15-27
Yes...	Gr....	2-3¾G-26½K.	Own.....	.....	Own.....	Shoe....	Own....	2	Spoke..	Yes...	Live....	Knuckle..	2	56x16	....	2	Struct...	96	9700	Case.....22-40
No...	Vac....	1-45G.....	Own.....	Eisemann.	Own.....	D. D....	Own....	3	Axle....	.....	.....	.....	.....	.....	2	....	Cast....	83	9300	Catterpillar.....T-11
No...	Vac....	1-45G.....	Own.....	K. W.....	Own.....	D. D....	Own....	3	Axle....	.....	.....	.....	.....	.....	2	....	Cast....	98	19500	Catterpillar.....T-16
.....	Gr....	2-1G-9K.....	.....	Dixie.....	Bierman.....	Shoe....	Own....	2	Rim....	.....	Dead...	Knuckle..	2	48x12	....	1	Struct...	60	5500	Chase.....12-25
.....	Gr....	2-¼G-6K.....	Own.....	.....	B. & B.....	Plate....	Own....	1	Axle....	No...	.....	Swinging..	.....	.....	.....	.....	None...	.....	.....	Cletrac.....F
No...	Gr....	2-¾G-13K.....	Own.....	.....	B. & B.....	D. D....	Own....	1	Axle....	No...	.....	.....	.....	.....	2	....	Struct...	.....	.....	Cletrac.....W
No...	Vac....	1-20G.....	Cyclone.	.....	Bierman.....	Shoe....	Own....	1	Axle....	.....	Live....	Knuckle..	1	42x10	....	2	Struct...	108	5300	Dakota.....
No...	Gr....	1-16G.....	Cyclone.	Bosch.....	B. & B.....	D. D....	Own....	3	Axle....	No...	Live....	Swinging..	4	40x12	....	....	Struct...	99	6800	Depue.....A
Yes...	Gr....	2-4G-20K.....	Bennett.	K. W.....	Own.....	Cone....	Own....	2	Spoke..	No...	Rev....	Knuckle..	2	54x12	....	2	Struct...	87½	4550	Emerson-Brant....12-20
Yes...	Gr....	1-4G-16K.....	Bennett.	K. W.....	Own.....	Cone....	Own....	3	Spoke..	No...	Dead...	Knuckle..	2	60x12	....	2	Struct...	93	6500	Emerson-Brant.....Q
Yes...	Gr....	1-5G-35K.....	Bennett.	Simms.....	Own.....	Cone....	Own....	2	Spoke..	Yes...	Dead...	Swinging..	2	72x16	....	2	Struct...	126	9400	Emerson-Brant....16-32
No...	Gr....	1-12G.....	Own.....	Dixie.....	Own.....	.....	Own....	1	Axle....	.....	.....	Knuckle..	2	.....	....	2	Struct...	97	3500	Fageol.....D
Yes...	Gr....	2-5G-15K.....	Oren....	Dixie.....	T. D.....	D. D....	.....	2	Spoke..	No...	Dead...	Knuckle..	2	52x26	....	2	Struct...	82	5200	Farm Horse.....B
No...	Gr....	2-5G-25K.....	R. W....	K. W.....	M. E.....	D. D....	Own....	2	Rim....	No...	Dead...	Knuckle..	2	54x10	....	2	Struct...	83	5700	Farquhar.....15-25
No...	Gr....	2-30G-30K.....	.....	K. W.....	Own.....	Fric....	Own....	1	Rim....	No...	Dead...	Swinging..	2	84x20	....	2	Struct...	132	16000	Farquhar.....4-30
No...	Gr....	2-30G-30K.....	.....	K. W.....	Own.....	Fric....	Own....	1	Rim....	No...	Dead...	Swinging..	2	84x24	....	2	Struct...	132	19000	Farquhar.....4-40
Yes...	Gr....	2-¼G-21K.....	Own.....	Own.....	Own.....	D. O....	Own....	3	Axle....	No...	Live....	Knuckle..	2	42x12	....	2	None...	63	2425	Fordson.....
Yes...	Vac....	2-2G-20K.....	.....	Dixie.....	Own.....	Shoe....	Own....	3	Spoke..	No...	Dead...	Knuckle..	2	60x12	....	2	Struct...	90	6700	Fox.....E
No...	Gr....	2-3G-20K.....	Bennett.	.....	Own.....	Shoe....	Nuttall..	2	Rim....	No...	Rev....	Knuckle..	2	60x10	....	2	Struct...	92	5700	Frick.....A
No...	Gr....	1-3G-17K.....	Bennett.	.....	Own.....	Shoe....	Nuttall..	2	Rim....	No...	Rev....	Knuckle..	2	60x12	....	2	Struct...	92	6450	Frick.....C
No...	Gr....	1-34G.....	Bennett.	Bosch	Own.....	Cone....	Own....	2	.....	.....	Rev....	Knuckle..	1	54x54	....	2	Struct...	.....	6200	Gray.....
Yes...	Gr....	2-1G-14K.....	Own.....	K. W.....	Own.....	Cont....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	46x10	....	2	Struct...	76	3750	Hart-Parr.....
Yes...	Gr....	2-1G-23K.....	Own.....	K. W.....	Own.....	Cont....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	52x18	....	2	Cast....	89	5275	Hart-Parr.....
Yes...	Gr....	2-7G-14K.....	Bennett.	.....	.....	.....	Own....	7	Axle....	No...	Live....	Knuckle..	2	54x 8	....	2	Struct...	90	4000	Heider.....D
Yes...	Gr....	2-7G-14K.....	Bennett.	.....	.....	.....	Own....	7	Axle....	No...	Live....	Knuckle..	2	57x10	....	2	Struct...	96	6000	Heider.....C
Yes...	Gr....	1-11½G-22K..	Bennett.	Kingston.	Own.....	Shoe....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	60x10	....	2	Struct...	91	5000	Huber.....
No...	Gr....	1-23½G.....	R. W....	Eisemann.	Own.....	D. D....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	60x10	....	2	Struct...	91	5800	Huber.....
No...	Gr....	1-3G-15K.....	Bennett.	.....	T. D.....	D. D....	Foote...	4	Axle....	No...	Live....	Knuckle..	2	54x12	....	2	Struct...	92	5000	Illinois.....C
Yes...	Gr....	1 or 2-70G....	Bennett.	K. W.....	Own.....	Shoe....	Own....	2	Rim....	Yes...	.....	Swinging..	2	96x30	....	2	Struct...	137	20800	Imperial.....
.....	Gr....	1-12G.....	Bennett.	Kent.....	Own.....	.....	Own....	4	Spoke..	No...	Dead...	Swinging..	2	50x12	....	2	Cast....	.....	2200	Indiana.....F
No...	Gr....	2-1½G-11½K.	Own.....	Dixie.....	Own.....	D. D....	Own....	3	Spoke..	.....	Dead...	Knuckle..	2	40x12	....	2	Struct...	85	3600	International.....8-16
Yes...	Gr....	2-1G-16K.....	Own.....	.....	Own.....	D. D....	Own....	.....	Axle....	.....	Live....	Knuckle..	2	50x12	....	2	Cast....	85	5400	International.....15-30
Yes...	Pres..	2-24K.....	Own.....	.....	Own.....	.....	Own....	2	Spoke..	.....	Dead...	Knuckle..	2	66x14	....	2	Pressed..	94	8700	International.....15-30
Yes...	Gr....	5G-20K.....	Bennett.	Splitdorf...	Own.....	Shoe....	Own....	2	Axle....	No...	Live....	Knuckle..	2	48x12	....	2	Channell	84	6000	Klumb.....
Yes...	Gr....	2-2G-40K.....	Own.....	Kingston..	Own.....	Shoe....	Own....	2	Axle....	Yes...	Rev....	Swinging..	2	60x18	....	....	Struct...	42	6000	Knudson.....
No...	Gr....	1-19G.....	Taco.....	Splitdorf...	Own.....	Shoe....	Own....	2	Spoke..	No...	Rev....	Knuckle..	2	48x12	....	2	Struct...	78	4500	Lauson.....S
.....	Gr....	1-2G-18K.....	Taco.....	Splitdorf...	Own.....	Shoe....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	54x12	....	2	Struct...	86	6000	Lauson.....15-30
No...	Gr....	1-3½G-30K...	United..	Dixie.....	B. & B.....	D. D....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	54x12	....	2	Struct...	76	5800	Leader.....M
No...	Gr....	1-3½G-20K...	United..	Dixie.....	B. & B.....	D. D....	Own....	2	.....	No...	Dead...	.....	.....	.....	....	2	Struct...	.....	6800	Leader.....G-U
No...	Vac....	1-28G.....	Own.....	Dixie.....	Hilliard.....	D. D....	Own....	2	.....	Yes...	.....	.....	4	50x12	....	....	Struct...	98	5500	Leonard.....
No...	Vac....	1-30G.....	.....	West'house	B.-L.....	D. D....	B.-L....	4	.....	No...	Dead...	Knuckle..	2	.....	2	....	Struct...	135	11000	Linn.....
Yes...	Gr....	1-5G-20K.....	Donald'n	.....	Own.....	Cone....	Own....	3	Rim....	No...	Dead...	Knuckle..	2	54x14	....	2	Struct...	87	5000	Little Giant.....B
Yes...	Gr....	1-5G-35K.....	Donald'n	.....	Own.....	Cone....	Own....	3	Rim....	No...	Dead...	Knuckle..	2	66x20	....	2	Struct...	102	8500	Little Giant.....A
Yes...	.....	2-3G-18.3K...	.....	K. W.....	.....	.....	Own....	2	Axle....	.....	Live....	Knuckle..	.....	56x12	.....	.....	Struct...	100	6600	Minneapolis.....
Yes...	.....	2-6G-17K.....	Bennett.	Dixie.....	Own.....	D. D....	Own....	2	Axle....	.....	Live....	Knuckle..	.....	54x12	.....	.....	Struct...	79⅞	6400	Minneapolis.....
Yes...	.....	2-9G-30K.....	.....	K. W.....	.....	.....	Own....	2	Axle....	.....	Live....	Swinging..	.....	62x10	.....	.....	Struct...	109½	12410	Minneapolis.....
Yes...	.....	2-20G-80K.....	.....	K. W.....	.....	.....	Own....	2	Axle....	.....	Live....	Swinging..	.....	85x30	.....	.....	Struct...	136	22500	Minneapolis.....
No...	Gr....	1-2G-10K.....	Bennett.	.....	B & B.....	D. D....	Own....	1	Axle....	No...	Live....	Swinging..	2	42x8	....	2	Cast....	67½	2300	Mohawk.....E
No...	Gr....	1-15G.....	Bennett.	Remy.....	B. & B.....	D. D....	Own....	1	Rim....	Yes...	Dead...	.....	2	52x8	....	....	None...	.....	3380	Moline.....D
No...	Gr....	1-28G.....	Bennett.	Bosch.....	T. D.....	D. D....	Own....	2	Axle....	No...	Live....	Knuckle..	3	52x10	....	2	Struct...	100	6850	Nilson.....
Yes...	Pres..	2-1G-23K.....	Donald..	.....	Own.....	Shoe....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	51x12	....	2	Struct...	80	6682	Oil Pull.....K
Yes...	Pres..	2-1G-31K.....	Donald..	.....	Own.....	Shoe....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	56x16	....	2	Struct...	92½	9600	Oil Pull.....H
Yes...	Pres..	2-1G-45K.....	Donald..	.....	Own.....	Shoe....	Own....	2	Rim....	No...	Rev....	Knuckle..	2	64x20	....	2	Struct...	103	12820	Oil Pull.....G
Yes...	Pres..	2-3G-70K.....	.....	.....	Own.....	Shoe....	Own....	1	Rim....	No...	Rev....	Swinging..	2	80x30	....	2	Struct...	141	26700	Oil Pull.....E
No...	Gr....	.....	.....	.....	Own.....	.....	Own....	1	Rim....	Yes...	Dead...	Knuckle..	2	48x7	....	2	Struct...	72	3000	Oshkosh.....M
Yes...	Gr....	2-1G-13K.....	Bennett.	Kent.....	Own.....	Cont....	Own....	1	Rim....	Yes...	Rev....	Knuckle..	2	56x10	....	2	Cast....	90	3800	Oshkosh.....H

ing; **Dist.**—Distillate; **Hori.**—Horizontal; **Pres.**—Pressure; **Throt.**—Throttle; **Cont.**—Contracting Band; **Fric.**—Friction; **G.**—Gasoline; **K.**—Kerosene **O.**—Oil; **B.-L.**—Brown-Lipe; **Ecc.**—Eccentric; **Hyd.**—Hydraulic; **T. D.**—Twin Disk.

DETAILED SPECIFICATIONS

	Price	Plow Capacity	Plowing Speed M. P. H.	H. P. Rating	ENGINE Make	No. Cyl. Bore and Stroke	Cylinder Type	R. P. M	Engine Type	Cylinder Cast	ENGINE Make of Governor	Type of Governor	Weight	Cooling Fluid	Cooling Capacity	Radiator Make	ENGINE Fluid Circulation	Lubrication System Type	Oil Pump Type	Carburetor Make and Size
Peoria L	1,600	3	3.0	12–25	Climax	4–5 x6½	L	800	Vert.	Pairs	Climax	Cent.	1000	W	11	Eureka	Pump	Hol. C. S.	Ecc	Stromb'g. 1½
Pioneer		4	2.5	20–40	Own	4–5½x6	L	750	Opp.	Pairs	Pierce	Cent.		W	20	S.-J	Pump	Hol. C. S.	Gear	Kingston 1½
Pioneer		10	2.5	40–75	Own	4–7 x8	L	650	Opp.	Pairs	Own	Cent.		W	35	S.-J	Pump	Hol. C. S.	Gear	Kingston 2
Port Huron A	1,500	3		12–25	Chief	4–4¾x6	I	900			Pickering	Cent.	1000	W	8¾	Bremer	Pump		Gear	Kingston
Reliable		2	2.25	10–20	Own	2–6 x7	I	600	Hori.	Pairs	Own	Cent.	1120	W	40	Own	Ther.	Mech.	Piston	Own 1¼
Rex	1,600	3	2.5	12–25	Wauk	4–4¼x5¾	L	900	Vert.	Pairs	Waukesha	Cent.		W			Pump	Cir. Sp.	Gear	Kingston 1½
Samson M		2–3	2.5 3.25		Own	4–4 x5½	L	1100	Vert.	Block	Own	Cent.	839	W	10		Pump	Hol. C. S.	Gear	Kingston 1¼
Sandusky J	1,250	2	2.0	10–20	Own	4–4¼x5¼	L	1050	Vert.	Block	Own	Cent.	849	W	8	Perfex	Pump	Cir. Sp.	Piston	Kingston 1¼
Sandusky E	1,750	4	2.0	15–35	Own	4–5 x6½	L	750	Vert.	Singly	Own	Cent.	2060	W	30	Perfex	Pump	Cir. Sp.	Piston	Kingston 2
Shelby C		2	2.6	9–18	Wauk	4–3¾x5¼	L	1000	Vert.	Block	Waukesha	Cent.	625	W	8	Modine	Pump	Cir. Sp.	Gear	Kingston 1¼
Shelby D		3	2.7	15–30	Beaver	4–4¾x6	I	900	Vert.	Block	Taco	Cent.	1000	W	10	Modine	Pump	Hol. C. S.	Gear	Kingston 1½
Steady Pull	1,485	3	2.5	12–24	Own	4–4 x5	I	900	Vert.	Block			800	W	6	Perfex	Pump	Cir. Sp.	Gear	Stromb'g. 1¼
Stinson	1,835	4	2.83	18–36	Beaver	4–4¾x6	I	1000	Vert.	Block			1000	W	10	Todd	Pump	Hol. C. S.	Gear	Kingston 1⅜
Tioga	2,625	3–4	2.7	15–27	W&MW	4–4½x6	I	1000	Vert.	Pairs	Pharo	Cent.	1200	W	7¾	G. & O	Pump	Hol. C. S.	Gear	Stromb'g. 1¼
Titan	900	3	2.75	10–20	Own	2–6½x8	I	575	Hori.	Pairs	Own	Cent.		W	40	Own	Ther.	Mech.		Ensign
Topp-Stewart B	3,500	4	2.5	30–45	Wauk	4–4¾x6¾	L	950	Vert.	Pairs	Waukesha	Cent.		W	12	Bremer	Pump	Cir. Sp.	Gear	Stromb'g. 1½
Toro		2	2.0	6–10	LeRoi	4–3½x4½	L	1200	Vert.	Block	LeRoi	Cent.	325	W	4	S.-J	Ther.	Cir. Sp.	Piston	Kingston ⅞
Townsend	895	2–3	2.5	10–20	Own	2–6½x7	I	550	Hori.	Pairs	Own	Cent.	1100	W	50	Own	Pump		Piston	Own 1½
Townsend	1,485	3–4	2.5	15–30	Own	2–7 x8	I	500	Hori.	Pairs	Own	Cent.	1600	W	70	Own	Pump	Hol. C. S.	Piston	Own 1¾
Townsend	2,750	6–8	2.5	25–50	Own	2–8½x10	I	475	Hori.	Pairs	Own	Cent.	2200	W	100	Own	Pump	Hol. C. S.	Piston	Own 2¼
Tracklayer 60	5,450	8	2.62	35–50	Own	4–6½x8½	I	650	Vert.	Singly	Own	Cent.	2600	W	18	Own	Pump	Cir. Sp.	Gear	Ensign 2
Traylor	715	1	2.75	6–12	LeRoi	4–3½x4½	L	1200	Vert.	Block	LeRoi	Cent.	330	W	4	G. & O	Ther.	Hol. C. S.	Gear	Kingston ⅞
Trundaar	3,750	4	2.5	25–40	Wauk	4–5 x6¼	L	850	Vert.	Pairs	Waukesha	Cent.		W	11	Modine	Pump	Hol. C. S.	Gear	Stromb'g. 1½
Twin City	1,580	3	2.9	12–20	Own	4–4¼x6	L	1000	Vert.	Block	Pierce	Cent.	1040	W	10½	Modine	Pump	Hol. C. S.	Gear	Holley 1¼
Twin City	3,175	5	2.9	20–35	Own	4–5½x6¾	I	900	Vert.	Block	Own	Cent.	1800	W	18	Modine	Pump	Hol. C. S.	Gear	Holley 2
Twin City	5,250	8	2.0	40–65	Own	4–7¾x9	I	535	Vert.	Singly	Own	Cent.	4125	W	130	Own	Pump	Mech.		Holley 2½
Wallis K		2–3	3.5	15–25	Own	4–4¼x5¾	I	900	Vert.	Singly	Own	Hyd.	750	W	6	Modine	Pump	Cir. Sp.	Piston	Bennett 1¼
Waterloo Boy N	1,450	3	3.0	12–25	Own	2–6½x7	I	950	Hori.	Pairs	Own	Cent.	1200	W	13	Modine	Pump	Cir. Sp.	Piston	Schebler 1½
Wellington B		2–3	2.25	12–22	Erd	4–4 x6	I	900	Vert.	Block	Erd	Cent.	860	W	7	Modine	Pump	Cir. Sp.	Piston	Stromb'g 1⅜
Wellington F		3	3.0	16–30	Chief	4–4¾x6	I	1000	Vert.	Block	Chief	Cent.	1020	W	9	Modine	Pump	Hol. C. S.	Gear	Stromb'g. 1½
Wetmore	1,585	3	3.37	12–25	Wauk	4–4 x5¾	L	1000	Vert.	Pairs	Waukesha	Cent.	900	W		Ideal	Pump	Hol. C. S.	Gear	Schebler 1¼
Whitney D	595	2	2.5	9–18	Own	2–5½x6½	L	750	Opp.	Singly	Own	Cent.	650	W			Pump	Mech.		1½
Wichita T	2,000	3–4	2.5	15–30	Beaver	4–4½x6	I	950	Vert.	Block	Duplex	Cent.	1080	W	9	Perfex	Pump	Hol. C. S.	Gear	Ensign 1¼
Wisconsin	2,450	4	2.5	20–40	Wauk	4–5 x6½	L	950	Vert.	Pairs	Waukesha	Cent.	1000	W	12	Perfex	Pump	Hol. C. S.	Gear	Stromb'g. 1½
Wisconsin	3,200	5	2.5		Climax	4–5½x7	L	800	Vert.	Pairs	Climax	Cent.	1500	W	18	Perfex	Pump	Hol. C. S.	Ecc	Stromb'g. 1½
Yuba	3,100			15–25	Wisc	4–4¼x6	L	800	Vert.	Block			920	W	5½	Modine	Pump	Cir. Sp.	Gear	Stromb'g. 1¼
Yuba	5,000			25–40	Own	4–5¼x7	I	700	Vert.	Pairs	Own	Cent.		W	9	Modine	Pump			Stromb'g. 1¼
Yuba	4,650			25–40	Wisc	4–5¾x7	T	700	Vert.	Pairs	Own	Cent.	1543	W	9	Modine	Pump	Cir. Sp.	Gear	Stromb'g. 1½
Zelle		3	2.5	12–25	Buda	4–4¼x5½	L	1000	Vert.	Block	Pierce	Cent.		W			Pump	Hol. C. S.	Gear	Carter

ABBREVIATIONS—**B. & B.**—Borg & Beck; **H. B.**—Horizontal Bars; **W.**—Water; **Hol. C. S.**—Hollow crankshaft; **Gr.**—Gravity; **Vac.**—Vacuum; **P.**—Pump; **Bring.**—Berling; **D. D.**—Dry Disk; **D. O.**—Disk in Oil; **Struct.**—Structural Steel; **Cent.**—Centrifugal; **Cir. Sp.**—Circulating splash; **Rev.**—Revolv-

Buyers' Guide to Tractors

One and Two Plows

Name and Model	Draw-bar H.P.	Belt H.P.	Price	Traction	Cylinders	Fuel
All-In-One	15	30	$1975	2 W	4 Ver.	G-K-D
Allis Chalmers	6	12	....	2 W	4 Ver.	G
Avery	8	16	....	2 W	4 Ver.	G-K-D
Case—10-18	10	18	....	2 W	4 Ver.	G-K-D
Cletrac—W	12	20	....	2 W	4 Ver.	G-K
Fageol—D	9	18	....	2 W	4 Ver.	G
Fordson	..	18	625	2 W	4 Ver.	K
Frick	12	20	....	2 W	4 Ver.	G-K
Hart-Parr—30	..	20	945	2 W	2 Hor.	K-D
Heider—D	9	16	870	2 W	4 Hor.	G
Indiana—F	5	10	895	2 W	4 Ver.	G
International—8-16	8	16	900	2 W	4 Ver.	G-K-D
Moline—D	9	18	990	2 W	4 Ver.	G
Oskosh—M	6	12	650	2 W	2 Hor.	G-K
Reliable	10	20	885	2 W	2 Hor.	K-D
Samson—M	..	..	....	2 W	4 Ver.	G-K
Sandusky—J	10	20	1250	2 W	4 Ver.	....
Shelby—C	9	18	....	2 W	4 Ver.	G
Toro	6	10	....	2 W	4 Ver.	G
Townsend	10	20	895	2 W	2 Hor.	G-K
Traylor	6	12	715	4 W	4 Ver.	G
Wallis—R	15	25	1600	2 W	4 Ver.	....
Wellington—B	12	22	....	2 W	4 Ver.	G-K
Whitney—D	9	18	595	3 W	2 Opp.	G-K

Three Plows

Name and Model	Draw-bar H.P.	Belt H.P.	Price	Traction	Cylinders	Fuel
Allis Chalmers	14	27	....	2 W	4 Ver.	G
Allis Chalmers	18	30	....	2 W	4 Ver.	K
Allwork—G	14	28	....	2 W	4 Ver.	G-K
Automotive	12	24	1785	2 W	4 ...	....
Avery	12	20	....	2 W	4 Opp.	....
Avery	12	25	....	2 W	2 Opp.	....

Three Plows (continued)

Name and Model	Draw-bar H.P.	Belt H.P.	Price	Traction	Cylinders	Fuel
Avery	14	28	....	2 W	4 Opp.	....
Avery Track Runner	..	..	....	....	4 Ver.	....
Bates	15	25	....	2 W	4 Hor.	G
Bates—(Steel Mule) F	18	25	....	....	4 Ver.	G
Burn—Oil	15	30	1495	2 W	2 Hor.	K
Case	15	27	....	2 W	4 Ver.	G-K-D
Chase	12	25	1825	2 W	4 Ver.	G-K
Dakota	15	27	1750	....	4 Ver.	G
Depue—A	20	30	2800	4 W	4 Ver.	G
Emerson—Brantingham	12	20	....	2 W	4 Ver.	K
Farquhar—15-25	15	25	....	2 W	4 Ver.	G-K
Frick—C	15	28	....	2 W	4 Ver.	G-K
Hart-Parr	..	30	1295	2 W	2 Hor.	K-D
Heider	12	20	995	2 W	4 Hor.	G-K
Huber	12	25	1185	2 W	4 Ver.	....
Huber	15	30	1885	2 W	4 Ver.	G
International	15	30	....	2 W	4 Ver.	G-K-D
Lauson—S	12	25	1495	2 W	4 Ver.	G
Lauson	15	30	1985	2 W	4 Ver.	G-K
Leader—M	16	32	....	2 W	4 Ver.	K
Leader—G.U	18	36	....	2 W	4 Ver.	K
Leonard	20	30	2530	4 W	4 Ver.	G
Minneapolis	12	15	900	....	4	G-K
Oil-Pull—K	12	20	1485	2 W	2 Hor.	K-D
Oskosh—G	12	24	985	2 W	2 Hor.	G-K
Peoria—L	12	15	1600	2 W	4 Ver.	K
Port Huron—A	12	25	1500	2 W	4 ...	G-K
Rex	12	25	1600	2 W	4 Ver.	K
Shelby—D	15	30	....	2 W	4 Ver.	G-K
Steady Pull	12	24	1485	2 W	4 Ver.	G-K
Tiogo	15	27	2625	2 W	4 Ver.	G-K
Titan	10	20	900	2 W	2 Ver.	....
Townsend	15	30	1485	2 W	2 Ver.	G-K

OF 1922 FARM TRACTORS

Water Injected with Fuel	Fuel Feed	Fuel Tanks and Capacities	Air Cleaner Make	Electrical System: Ignition System Make	CLUTCH: Make	CLUTCH: Type	TRANSMISSION: Make of Transmission	TRANSMISSION: No. Forward Speeds	TRANSMISSION: Final Drive	TRANSMISSION: Differential Lock	TRANSMISSION: Drive Wheel Axle Type	TRANSMISSION: Steering Type	WHEELS: No. Driving Wheel	WHEELS: Diameter and Face	WHEELS: No. of Tracks	WHEELS: No. of Non-drive	FRAME: Material	FRAME: Wheelbase	Total Weight	Name and Model
No	Gr	1-5G-25K	Taco	Eisemann	Own	Cone	Own	3	Axle	No	Live	Knuckle	2	50x12		2	None	84	4700	Peoria L
Yes	Gr	1-30G	Bennett		Own	D. O	Own	3	Hub	No	Live	Knuckle	2	60x18		2	Struct	89	6500	Pioneer
Yes	Gr	2-75G-30K	Bennett	K. W	Own	D. D	Own	3	Hub	No	Live	Knuckle	2	96x24		2	Struct	156	24000	Pioneer
No	Gr	5G-25K	Own	Eisemann	Rock	Fric	Own	2	Rim	No	Rev	Knuckle	2	56x10		2	Chan	93	5960	Port Huron A
Yes	Pres	1-15K		Dixie	Own	Shoe	Own	1	Axle	No	Live	Swinging	2	48x10		2	Struct	66	3785	Reliable
No	Gr	1-5G-20K		K. W		D. D	Own	2	Rim	No	Live	Knuckle	2	60x10		2	Struct		5600	Rex
No	Gr	2-3G-20K	Own	Simms	Own	D. O	Own	2	Axle	No	Live	Knuckle	2	45x12		2	None	64¼	3034	Samson M
Yes	Gr	1-5G-15K	Bennett		Own	Cone	Own	2	Rim	No		Knuckle	2	48x12		2	Struct	96	4724	Sandusky J
Yes	Gr	1-5G-25K	Bennett		Own	Shoe	Own	3	Rim	No		Swinging	2	56x16		2	Struct	100	8228	Sandusky E
No	Gr	1-17G	Bennett	Dixie	Fuller	D. O	Fuller	3	Axle	No	Dead	Knuckle	2	42x12		2	Struct	72	3300	Shelby C
No	Gr	2-4G-14K	Bennett	Dixie	T. D	D. D	Foote	2	Rim	No	Live	Knuckle	2	48x12		2	Struct	80	4500	Shelby D
No	Gr	1-15G	Oren	Bosch	T. D	D. D	Foote	2	Spoke	No	Dead	Knuckle	2	42x12		2	Struct	87	3450	Steady Pull
Yes	Gr	1-32½K	Own	Dixie	Own	Cont	Own	1	Axle	No	Live	Knuckle	2	60x12		2	Cast	114	7200	Stinson
No	Gr	2-1G-24K	Optional	Dixie	T. D	D. D	Own	2	Hub	Yes	Dead	Knuckle	2	36x16		2	Struct	81⅞	5200	Tioga
No		1-16K	Own	K. W	Own	Shoe	Own	2	Spoke	No	Dead	Knuckle	2	54x10		2	Struct	91	5710	Titan
No	Gr	1-25G	Bennett	Eisemann	Hilliard	D. O	Own	3	Rim	No	Dead	Swinging	4	42x12			Struct	100	7800	Topp-Stewart B
No	Gr	1-11G	Donald		Own	Cont	Own	2	Spoke	No	Dead	Knuckle	2	41x6		2	None	54	2600	Toro
Yes	Pres	1-12K	Optional	K. W	Own	Shoe	Own	1	Axle	No	Live	Knuckle	2	48x12		2	Struct	84	4500	Townsend
Yes	Pres	1-18K	Optional	K. W	Own	Shoe	Own	1	Axle	No	Live	Knuckle	2	56x18		2	Struct	90	6500	Townsend
Yes	Pres	1-35K	Optional	K. W	Own	Shoe	Own	1	Axle	No	Live	Knuckle	2	60x24		2	Struct	110		Townsend
No	Vac	2-5G-55K	Pomona	K. W	Own	Plate	Own	2	Rim	No	Dead				2		Struct			Tracklayer 60
No	Gr	1-12G	Oren	Dixie	B. & B	D. D	Own	1	Rim	No	Dead	Knuckle	4	38x10		2	Struct	76	1750	Trayler
	Gr	2-3G-26K	Own	Bosch	Hilliard	Plate	Own	2	Axle	No	Live				2		None		9200	Trundaar
No	Gr	2-1½G-23K	Bennett	Bosch	T. D	D. D	Own	2	Axle	No	Live	Knuckle	2	50x12		2	Cast	84	4660	Twin City
No	Gr	2-1½G-40K	Bennett	Bosch	T. D	D. D	Own	2	Axle	No	Live	Knuckle	2	60x20		2	Cast	97	8440	Twin City
No	Gr	2-10G-95K		K. W	Own	Cont	Own	1	Rim	No	Rev	Knuckle	2	84x24		2	Struct	144	23700	Twin City
No	Gr	1-20G or K	Bennett	Brlng	T. D	D. D	Own	2	Axle	No	Live	Knuckle	2	48x12		2	Pressed	84	3560	Wallis K
Yes	Gr	2-1G-20K		Dixie	Own	Cont	Own	2	Rim	No	Rev	Knuckle	2	52x12		2	Struct		5010	Waterloo Boy N
No	Gr	2-10G-20K	R. W	Dixie	T. D	D. D	Foote	2	Spoke	No	Rev	Knuckle	2	48x12		2	Struct	85½	4500	Wellington B
No	Gr	2-10G-15K	R. W	Dixie	T. D	D. D	Foote	2	Axle	No	Live	Knuckle	2	48x12		2	Struct	75½	5000	Wellington F
No	Gr	2-2G-12K			Fuller	D. O	Fuller	3	Spoke	No	Dead	Knuckle	2	46x10		2	Struct	74	2900	Wetmore
No	Gr	2-2G-15K			Own	Cont	Own	3	Axle	No	Live	Knuckle		48x10			Pressed	81	3000	Whitney D
No	Gr	2-½G-28K	Bennett		T. D	D. D	Nuttall	2	Axle	No	Live	Knuckle	2	48x12		2	Struct	93⅝	6000	Wichita T
No	Gr	2-5G-25K	Optional		T. D	D. D	Foote	2	Rim	No	Rev	Knuckle	2	52x12		2	Struct	90	5440	Wisconsin
No	Gr	2-5G-25K	Optional		T. D	D. D	Foote	2	Rim	No	Rev	Knuckle	2	52x12			Struct	92	7800	Wisconsin
No	Gr	2	Pomona	Bosch	Paragon	D. D	Own	2		No		Swinging			2		Struct	90	5680	Yuba
No	Gr	2-4G-21D	Pomona	Bosch	Paragon	D. D	Own	2		No		Swinging			2		Struct		9980	Yuba
No	Gr	2-8G-38K	Pomona	Bosch	Paragon	D. D	Own	2		No	Dead	Swinging			2		Struct		9980	Yuba
Yes	Vac	2-5G-25K	Leonard	Bosch	B. & B	D. D	Own	4	Rim	No	Rev	Knuckle	2			2	Struct	72	3800	Zelle

ing; **Dist.**—Distillate; **Hori.**—Horizontal; **Pres.**—Pressure; **Throt.**—Throttle; **Cont.**—Contracting Band; **Fric.**—Friction; **G.**—Gasoline; **K.**—Kerosene; **O.**—Oil; **B.-L.**—Brown-Lipe; **Ecc.**—Eccentric; **Hyd.**—Hydraulic; **T. D.**—Twin Disk.

Three Plows (continued)

Name and Model	Draw-bar H.P.	Belt H.P.	Price	Traction	Cylinders	Fuel
Twin City	12	20	1580	2 W	4 Ver.	....
Waterloo Boy—N	12	25	1450	2 W	2 Ver.	G-K
Wellington—F	16	30	....	2 W	4 Ver.	G-K
Wetmore	12	25	1585	2 W	4 Ver.	G-K
Wichita	15	30	2000	2 W	4 Ver.	G-K
Zelle	15	25	....	2 W	4 Ver.	G-K

Four Plows

Name and Model	Draw-bar H.P.	Belt H.P.	Price	Traction	Cylinders	Fuel
Allis Chalmers	22	38	....	2 W	4 Ver.	G
Aultman & Taylor	15	30	....	2 W	4 Ver.	K-D
Avery	18	36	....	2 W	4 Opp.	....
Best—30	18	30	....	2 Cr.	4 Ver.	G-D
Case	22	40	....	2 W	4 Ver.	....
Caterpillar—T-11	25	..	....	2 Cr.	4 Ver.	G
Emerson-Brautingham	16	32	....	2 W	4 Ver.	K
Farm Horse	18	30	1885	2 W	4 Ver.	G-K
Farquhar—4-30	18	35	....	2 W	4 Ver.	G-K
Fox—E	20	40	3100	2 W	4 Hor.	G-K
Gray	18	36	....	....	4 Ver.	G
Illinois—C	15	30	....	2 W	4 Hor.	G-K
International—15-30	15	30	....	2 W	4 Hor.	....
Klumb	18	32	....	2 W	4 ...	G
Knudson	12	25	2000	2 W	4 Ver.	....
Little Giant	16	32	2200	2 W	4 Ver.	G-K
Minneapolis	17	30	....	....	4	....
Minneapolis	22	44	....	....	4	G-K
Nilson	20	40	2475	2 W	4 Hor.	G
Oil Pull	16	30	1485	2 W	2 Hor.	K.D
Pioneer	20	40	....	2 W	4 Opp.	G-K
Sandusky—E	15	35	1750	2 W	4 Ver.	....
Stinson	18	36	1835	2 W	4	G-K
Townsend	25	50	2750	2 W	2 Hor.	G-K
Topp-Stewart—B	30	45	3500	4 W	4	G
Trumdaar—10	25	40	3750	....	4 Ver.	....
Wisconsin	20	40	2450	2 W	4 Ver.	G-K

Five and Six Plows

Name and Model	Draw-bar H.P.	Belt H.P.	Price	Traction	Cylinders	Fuel
Aultman & Taylor	22	45	....	2 W	4 Hor.	G-K
Avery	25	50	....	2 W	4 Opp.	....
Caterpillar—T-16	40	..	....	2 W	4 Ver.	G
Farquhar—4-40	25	60	....	2 W	4 Ver.	G-K
Linn	..	..	5100	2 W	4 Ver.	G
Little Giant	26	55	3300	2 W	4 Ver.	G-K
Oil Pull—G	20	40	3175	2 W	2 Hor.	K-D
Townsend	25	50	2750	2 W	2 Hor.	G-K
Twin City	20	35	3175	2 W	4 Ver.	....

Eight Plows and Over

Name and Model	Draw-bar H.P.	Belt H.P.	Price	Traction	Cylinders	Fuel
Aultman & Taylor	30	60	....	2 W	4 Hor.	G-K
Avery	45	65	....	2 W	4 Opp.	....
Imperial	40	70	5000	2 W	4 Hor.	G
Minneapolis	35	70	....	.....	4	....
Oil Pull—E	30	60	4590	2 W	2 Hor.	K-D
Pioneer	40	75	....	2 W	4 Opp.	G
Tracklayer—60	35	50	5450	2 W	4 Ver.	G-D
Twin City	40	65	5250	2 W	4 Ver.	....

ABBREVIATIONS FOR BUYER'S GUIDE TO TRACTORS

TRACTION:—
- **Cr**—Crawler
- **W**—Wheel

CYLINDERS:—
- **Hor**—Horizontal
- **Opp**—Opposed
- **Ver**—Vertical

FUEL:—
- **G**—Gasoline
- **K**—Kerosene
- **G-K**—Gasoline, Kerosene
- **G-K-D**—Gasoline, Kerosene, Distillate
- **G-D**—Gasoline Distillate
- **K-D**—Kerosene Distillate

10,449,785 Cars and Trucks Registered in 1921

and All Require Service, Parts and Accessories

This Is a Valuable Statistical Picture of the Importance of the Industry and Its Potential Needs

How Does Your Territory Compare with Other States?

IN 1921 there was a gain of 1,517,327 motor cars and trucks over the 1920 registration figures, or a gain of 16.9 per cent. It means, among other things, that there are over 10,449,785 passenger cars and trucks, to say nothing about tractors, in this country which must be serviced. Since there are 16.9 per cent more vehicles registered, it means also that just so much more business, potentially, exists for the service departments of the dealers in this country.

The coming of the summer months brings with it a rapid rising of the curve in the service business and it is for this period that the dealer must prepare. Especially is this true in view of the fact that registration figures constantly are climbing.

NEW cars are coming in all the time and it is gratifying to note that of late there has been a tendency for better operation of the service departments of various deal-

Registration of Cars, Trucks and Motorcycles

STATE	Total Net Registration	Non-Resident and Re-Registration	Passenger Cars	Commercial Cars	Motorcycles	Total Fees
Alabama	82,343	.....	73,233	9,110	805	$935,872.19
Arizona	35,220	1,576	30,312	4,908	.....	195,981.75
*Arkansas	67,413	509	66,477	936	171	.....
California	674,830	.....	638,922	35,908	17,603	6,990,981.04
*Colorado	145,370	.....	136,000	9,370	2,860	905,000.00
*Connecticut	135,460	.....	109,160	26,300	.....	.....
*Delaware	21,500	.....	.....	.....	.....	.....
District of Columbia	61,745	.....	54,147	6,976	2,487	383,289.00
Florida	97,837	.....	82,992	14,845	1,296	.....
Georgia	131,942	2,511	.....	.....	1,338	1,770,724.02
Idaho	51,300	.....	.....	.....	.....	.....
Illinois	670,452	.....	590,564	79,906	7,104	6,803,456.22
Indiana	400,342	.....	357,025	43,317	7,524	2,422,171.00
Iowa	430,003	112,994	399,478	30,525	3,897	7,718,926.19
Kansas	291,309	4,205	269,661	21,648	2,271	*3,000,000.00
Kentucky	125,627	8,759	110,602	15,025	1,175	1,771,887.02
*Louisiana	80,000	.....	72,000	8,000	.....	.....
Maine	77,530	7,240	67,593	9,937	1,525	1,004,653.00
*Maryland	140,000	.....	.....	.....	.....	.....
Massachusetts	363,032	.....	307,471	55,561	12,060	4,716,890.00
Michigan	477,037	42,996	426,984	50,053	6,195	6,526,387.01
Minnesota	328,700	.....	301,900	26,800	3,500	5,600,000.00
Mississippi	65,120	.....	58,420	6,700	375	798,306.07
*Missouri	343,386	.....	.....	.....	.....	.....
Montana	54,175	.....	.....	.....	.....	.....
Nebraska	242,557	.....	223,457	19,100	1,765	.....
Nevada	10,819	.....	.....	.....	130	102,800.00
*New Hampshire	42,500	.....	37,030	5,440	.....	.....
New Jersey	271,605	50,039	.....	.....	9,706	3,960,122.71
New Mexico	28,780	.....	23,780	5,000	200	.....
New York	754,085	.....	581,915	172,170	25,024	9,686,561.49
North Carolina	148,684	.....	134,884	13,800	1,276	2,250,000.00
North Dakota	92,643	6,261	90,300	2,343	810	683,052.45
*Ohio	742,713	32,452	647,774	94,939	21,938	6,795,522.99
Oklahoma	221,300	.....	.....	.....	1,013	2,619,713.49
Oregon	118,615	19,103	103,855	14,760	3,164	2,334,782.25
Pennsylvania	689,589	.....	632,541	57,048	21,111	9,443,640.77
Rhode Island	53,721	.....	43,824	9,897	1,683	.....
South Carolina	90,546	1,394	83,349	7,197	756	733,820.01
South Dakota	119,262	.....	110,998	8,264	682	720,587.00
Tennessee	117,025	6,500	102,795	14,230	1,043	1,325,000.00
Texas	467,788	.....	.....	.....	3,902	2,146,873.00
Utah	47,485	.....	40,562	6,923	1,003	441,283.88
Vermont	37,265	4,195	33,778	3,487	965	668,288.50
Virginia	141,000	.....	125,000	16,000	2,200	2,100,000.00
Washington	186,170	.....	157,504	28,666	3,878	2,925,730.74
West Virginia	105,000	.....	90,000	15,000	.....	2,000,000.00
Wisconsin	342,060	.....	320,755	21,305	6,435	3,648,465.00
*Wyoming	26,900	100	24,000	2,900	324	288,083.08
TOTALS	10,449,785	300,834	7,628,949	958,295	181,194	$98,499,925.66

*Estimated. *The tables used in this article were compiled by Automotive Industries, New York*

Number of Persons Per Car by States

December 31, 1921

State	Population	Car and Truck Registrations	No. Persons Per Car
California	3,426,861	674,830	5.19
So. Dakota	636,547	119,262	5.33
Nebraska	1,296,372	242,557	5.34
Kansas	1,769,257	291,309	6.07
Colorado	939,629	145,370	6.46
Oregon	783,389	118,615	6.60
No. Dakota	646,872	92,643	6.98
Dist. of Col.	437,451	61,745	7.14
Nevada	77,407	10,819	7.15
Wyoming	194,402	26,900	7.22
Minnesota	2,387,125	328,700	7.26
Washington	1,356,621	186,170	7.28
Iowa	2,404,021	430,003	7.31
Indiana	2,930,390	400,342	7.31
Michigan	3,668,412	477,037	7.69
Wisconsin	2,632,067	342,060	7.69
Ohio	5,759,394	742,713	7.75
Idaho	431,866	51,300	8.41
Oklahoma	2,028,283	221,300	9.16
Vermont	352,428	37,265	9.45
Utah	449,396	47,485	9.48
Arizona	334,162	35,220	9.48
Illinois	6,485,280	670,452	9.77
Florida	698,470	97,837	9.88
Maine	768,014	77,530	9.90
Missouri	3,404,055	343,386	9.91
Texas	4,663,228	467,788	9.97
Massachusetts	3,852,356	363,032	10.11
Montana	548,889	54,175	10.13
New Hamp.	433,083	42,500	10.19
Connecticut	1,380,631	135,460	10.19
Maryland	1,449,661	140,000	10.35
Delaware	223,003	21,500	10.37
Rhode Island	604,397	53,721	11.25
New Jersey	3,155,900	271,605	11.69
N. Mexico	360,350	28,780	12.52
Pennsylvania	8,720,017	689,589	12.64
W. Virginia	1,463,701	105,000	13.08
New York	10,385,227	754,085	13.77
Virginia	2,309,187	141,000	15.92
N. Carolina	2,559,123	148,684	17.25
S. Carolina	1,683,724	90,546	18.59
Kentucky	2,416,630	125,627	19.24
Tennessee	2,337,885	117,025	19.97
Alabama	2,348,174	82,343	20.84
Georgia	2,895.832	131,942	21.94
Louisiana	1,798.509	80,000	22.48
Arkansas	1,752,204	67,413	25.99
Mississippi	1,790,618	65,120	27.50
Totals	105,710,620	10,449,785	10.10

Motor Vehicle Registration from 1912 to 1921

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921
Alabama	3,385	5,435	8,078	11,925	21,636	32,873	46,171	58,898	74,637	82,343
Arizona	1,624	3,098	5,040	7,318	12,124	19,890	23,905	28,979	34,559	35,220
Arkansas	2,250	3,000	5,642	8,021	15,000	28,693	41,458	49,450	59,062	67,413
California	88,699	60,000	123,516	163,795	232,440	306,916	364,800	477,450	568,892	674,830
Colorado	8,950	13,135	17,756	27,568	43,296	66,850	83,630	104,865	128,951	145,370
Connecticut	24,101	27,189	33,009	43,985	61,855	85,724	92,605	109,651	119,134	135,460
Delaware	1,732	2,350	3,050	4,657	7,102	10,700	12,955	16,152	18,300	21,500
Dist. of Col.	1,732	2,373	4,833	8,009	13,118	15,493	30,490	35,400	9,712	61,745
Florida	1,749	2,372	3,368	10,850	20,718	27,000	54,186	55,400	*73,914	97,837
Georgia	19,120	18,500	20,916	25,671	47,579	70,357	99,800	127,326	144,422	131,942
Idaho	2,500	2,173	3,346	7,071	12,999	24,731	32,289	42,220	50,873	51,300
Illinois	68,073	94,656	131,140	180,832	248,429	340,292	389,620	478,438	568,759	670,452
Indiana	54,334	47,000	66,400	96,915	139,317	192,192	227,160	277,255	332,707	400,342
Iowa	47,188	75,088	112,134	152,134	198,602	254,317	278,313	363,857	437,300	430,003
Kansas	22,000	34,366	49,374	72,520	112,122	159,343	189,163	227,752	265,396	291,309
Kentucky	5,147	7,210	11,746	19,500	31,700	47,416	65,870	90,341	112,685	125,627
Louisiana	7,000	7,200	12,000	11,380	17,000	28,394	40,000	51,000	66,000	80,000
Maine	7,743	10,570	15,700	21,545	30,972	41,499	40,372	53,425	62,907	77,530
Maryland	10,487	14,254	20,218	31,047	44,245	60,943	74,666	95,634	*116,347	140,000
Massachusetts	50,132	62,660	77,246	102,633	136,809	174,274	193,497	247,183	304,631	363,032
Michigan	39,579	54,366	76,389	114,845	160,052	247,006	262,125	325,813	412,717	477,037
Minnesota	29,000	37,500	67,862	93,269	46,000	54,009	204,458	259,743	65,517	328,700
Mississippi	2,895	3,000	5,964	9,669	25,000	36,600	48,400	45,030	63,484	65,120
Missouri	24,379	38,140	54,468	76,462	103,587	147,528	188,040	244,363	296,919	343,386
Montana	2,000	5,686	10,172	14,499	24,440	42,696	51,037	59,325	60,646	54,175
Nebraska	33,861	25,617	40,929	59,140	100,534	148,101	175,409	192,000	223,000	242,557
Nevada	900	1,131	1,487	2,009	4,919	7,160	8,159	9,305	10,464	10,819
New Hampshire	5,764	7,420	9,571	13,449	17,508	22,267	24,817	31,625	34,680	42,500
New Jersey	43,056	48,892	60,247	78,232	104,341	134,964	155,519	190,873	227,737	271,605
New Mexico	911	1,721	2,945	5,100	8,228	8,467	15,000	18,077	22,109	28,780
New York	107,262	134,405	169,966	234,032	317,866	411,567	463,758	571,662	669,290	754,085
North Carolina	6,178	10,000	14,677	21,000	33,904	56,950	72,313	109,017	140,860	148,684
North Dakota	8,997	13,075	15,701	24,908	40,446	62,993	71,627	82,885	90,840	92,643
Ohio	63,066	86,054	122,504	181,332	252,431	346,772	412,775	511,031	615,397	742,713
Oklahoma	6,524	7,934	13,500	25,032	52,718	100,199	121,500	144,500	204,300	221,300
Oregon	10,165	13,957	16,447	23,585	33,917	48,632	63,324	83,332	103,790	118,615
Pennsylvania	59,357	76,178	112,854	160,137	230,578	325,153	394,186	482,117	570,164	689,589
Rhode Island	8,565	10,294	12,331	16,362	21,406	37,046	36,218	44,833	50,375	53,721
South Carolina	10,000	11,500	14,500	15,000	19,000	39,527	55,492	70,143	92,819	90,546
South Dakota	14,481	14,578	20,929	28,784	44,271	67,158	90,521	104,628	120,395	119,262
Tennessee	35,187	54,362	19,769	7,618	30,000	48,000	63,000	80,422	101,852	117,025
Texas	35,187	54,362	64,732	90,000	197,687	213,334	251,118	331,310	427,493	467,788
Utah	2,576	4,021	2,253	9,177	13,507	24,076	32,273	35,236	42,578	47,485
Vermont	4,283	5,918	8,256	11,499	15,671	20,369	22,655	26,807	31,625	37,265
Virginia	5,760	9,022	14,002	21,357	35,426	55,000	72,228	94,120	134,000	141,000
Washington	13,990	24,178	30,253	38,823	60,734	91,337	117,278	148,775	*173,920	186,170
W. Virginia	5,349	5,088	6,159	13,279	20,571	31,300	38,750	50,203	78,862	105,000
Wisconsin	24,578	34,646	53,161	79,791	115,637	164,531	196,844	236,981	293,298	342,060
Wyoming	1,300	1,584	2,428	3,976	7,125	12,523	16,200	21,371	23,926	26,900
Totals	1,033,096	1,287,558	1,768,720	2,479,742	3,584,567	4,992,152	6,105,974	7,596,503	8,932,458	10,449,785

*Estimated.

ers throughout the country. The customer rapidly is being recognized as the ultimate boss for whom the service department is operating, because in the long run it is he who keeps a certain make of car sold and it is he who makes it possible for the factory, distributor, dealer and repair shop to continue to do business.

THERE is every indication that this year will see service sold better than ever before. The flat rate system, good equipment and a better understanding between dealer and customer are going to be instrumental in bringing this about. The factory is giving service more attention than ever. This is well brought out in the new cars this year, because accessibility, which, after all, means a reduction in the cost of maintenance, is in evidence in most of the new designs.

Some of the immediate problems confronting dealers' service departments consists of getting more intensive service and repair work out of present facilities or installing needed equipment in order to handle the greater volume of work which, potentially at least, is shown to be here. All this means better arrangements of buildings, better policies, labor saving equipment, good mechanics, selling service to a plan, cleaner buildings, better accounting methods, etc. These make it possible to get more work done in less time and without adding to the size of the building or even taking on more men.

Gains Made in Car and Truck Registration

Ohio	127,316
Pennsylvania	119,426
California	105,938
Illinois	101,693
New York	84,795
Indiana	67,635
Michigan	64,320
Massachusetts	58,401
Wisconsin	48,762
Missouri	46,467
New Jersey	43,868
Texas	40,095
West Virginia	26,138
Kansas	25,913
Florida	23,923
Maryland	23.659
Nebraska	19,557
Oklahoma	17,000
Colorado	16.419
Connecticut	16,326
Tennessee	15,173
Oregon	14,825
Maine	14,623
Louisiana	14,000
Kentucky	12,942
Washington	12,250
Arkansas	8,331
North Carolina	7,824
New Hampshire	7,820
Alabama	7,706
Virginia	7,000
New Mexico	6,671
Vermont	5,640
Utah	4,907
Rhode Island	3,346
Delaware	3,200
Wyoming	2,974
North Dakota	1,803
Mississippi	1,636
Arizona	661
Idaho	427
Nevada	355
*District of Columbia	52,033
*Minnesota	263,183
	1,546,980

DECREASES IN CAR AND TRUCK REGISTRATION

Georgia	12,480
Iowa	7,297
Montana	6,471
South Carolina	2,272
South Dakota	1,133
	29,653
Total gain	1,517,327

MOTOR AGE

Reg. U. S. Pat. Off.
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The Chicago Show

THERE was considerable anxiety on the part of the professional visitors to New York at the time of the show in that city to know what the future held for the industry. In the consideration of these grave questions the detail of how the cars were to be presented to the public was to a large extent overlooked and numerous young men were turned loose to tell the public about what they wished to know.

Now comes the Chicago show and a very different environment. The friendliness of the public being settled, the Chicago dealers set about properly presenting the cars and the industry to that large section of the public which will pay 75 cents to see the annual exhibition of cars. This gives to the Chicago show an entirely different interest to those whose chief interest is that of manufacturing and selling automotive vehicles.

It was quite noticeable that during the first sessions of the show there were fewer factory representatives present at the Chicago Show than at New York. Also that a greater number of Chicago distributors and dealers were present at the first sessions of the Chicago show than New Yorkers were in attendance at the New York show.

The interest in the Chicago show is openly in the selling that results. The Chicago dealers are conducting a most interesting experiment in training their representatives in the show in a method of selling the industry rather than the single car. They have taken radical steps to insure that the prospect who stops at an exhibit will hear something besides the price. This effort is something new in show work and the most surprising fact connected with it is that it has taken almost a quarter of a century to realize that this is a good thing to do.

A somewhat similar experiment has been tried in some other cities, notably in St. Louis, when the "open week" was a fall feature. The results there were good as far as the experiment was tried, which was chiefly in encouraging the men in any salesroom to assist persons in reaching other salesrooms. But giving to the salesmen proper data on which to base their talks concerning the industry as a whole is novel.

This experiment and the keying up of the salesmen by the two weeks of intensive training should bring excellent results. We expect to report later that it has.

The opening of the Chicago show was encouraging to those who hope for a price stabilization. Practically no price adjustments were announced and no indications were given that any were to come.

Something to Avoid

PERHAPS the most pertinent comment concerning the New York show was written by S. A. Miles, the veteran manager of the New York and Chicago shows. Mr. Miles has had a long experience in show conduct and he has seen failures and successes. He has made a life study of shows and how to profit by them. The comment on the New York show is especially pertinent as it comes at the beginning of the season and should enable every dealer who is sending salesmen into a show to properly instruct them so as to avoid a similar failure. We reprint here Mr. Miles' criticism:

SOME of the exhibitors at the New York automobile show were guilty of three grave errors. These three errors were:

Incessant conversation about prices.
Incompetent salesmanship.
Lack of interest in prospective purchasers.

There were very creditable exceptions, but, speaking generally, we descended from the high class salesmanship of earlier years to a lugubrious, week-long discussion of falling prices. We placed ourselves on the level of the drummer who sells pig iron by the ton or the farmer who sells corn by the bushel.

We suffered from price hysteria. We regulated salesmanship to the scrap heap. We encouraged the public to postpone purchases, expectant of still further declines.

We did not dwell to the extent we should have on the results of the 20 years' experience and studious endeavor. We made all too little reference to the design and mechanical excellence of our cars and their meaning in the matter of durability, comfort and ecomony.

We neglected opportunities to discuss material weight, strength, durability, and made little effort to compare it with that of bygone years. We did not make the most of improved workmanship. We did not present an adequate picture of the car of today,

of the value of the dollar and the car, compared with pre-war times, or the added cost of material and men. We did not dwell upon the service of today and the long life of the car. We did not talk our prices up. We talked them down.

We talked price from morning until night. We radiated price. We daubed our cars with bargain counter announcements of price.

Have we salesmen with brains, familiar with the points of our machines, capable of comparison, able to ascertain what the inquirer expects in a car; to tell him how good a car is and sell him the merits of the car?

Or are we merely automatons to tell the prospective buyer how cheap the car is and how much we expect to allow him on his old vehicle?

It is too late to prevent the harm that was done in New York, but it is not too late to prevent a repetition of it in Chicago.

In view of the above comment, it is well that the Chicago distributors who are to supply the salesmen for the Chicago show undertake to train their men especially for this work. In addition to giving the men some idea of how to talk to the public that visits the show, they have been instructed on the main points as to the progress of the industry in the past year and as to its future. Chicago, at the beginning of the show, appears to be in a very good position to escape the criticism that was passed on the New York show.

The Value of Records

SOME letters are very interesting and at the same time instructive. One of this kind of letters has recently come to the attention of the writer, and in this letter a mid-western car dealer, who has a very excellent service department, discusses his ambitions and to a considerable length his practices. The letter was not written for publication but the writer certainly will not object to the publication of some points that he makes in his communication.

After referring to the fact that his organization of 18 men had been able to show some profit during the past year and that he has been able to hold all of the help for the future, the writer goes into detail on some of the things that he has found helpful.

First of all he mentions the fact that none of the men in his salesroom or shop smoke while on duty and only two of the men use profanity and they are rapidly training themselves to the new standard of conduct because they see the benefit of it in a business way. The best part of this good conduct platform is that the men are entirely sold on the standard adopted by the company and believe that in living up to the high standards, they are insuring themselves a better wage and a better standard of living, and they are enjoying both.

But the real punch in this letter comes in a paragraph which describes the business records. He writes:

"Without a doubt, one of the main reasons why most garages go under is that no one in the whole organization knows how much any three men lose and how much any one man must make. It is true that what we have learned from our facts and figures would make a lot of men hurry and get out of business if they did not have some sound ideas of how they could remedy these defects. Our 1921 records show that one mechanic brought in nearly $2 cash to another man's $1, and that each man was practically on duty the same number of hours during the year and the same number of hours on jobs of our own, and the same rate per hour was charged for their labor. One year we found that the lowest paid man in our shop produced the most dollars from labor during the year."

This man keeps books on his own efforts and when he found that the returns from his sales were slightly more than half of the total income of the company, he recognized a very unhealthy condition and set about to raise the total of the other persons connected with selling. He was fearful as to what might happen should he be compelled to be absent for a few days.

Behind all of this, of course, is the value of figures and facts to the man who is responsible for a business organization. It is difficult to find anything more worthless than figures and statistics that have no bearing on the problems of the business or which are not applied to the problems. But the value of the facts and figures that have a bearing on the business problems in hand and which are applied to these problems, are the most valuable work that can be done. No man can afford to carry unprofitable persons on his payroll under the conditions of business today. It may not sound like much to pay a man $3 a day, but $900 a year, and year after year, is a pretty big obligation. Why not get the facts and figures to learn if you are getting the value from the money you are paying?

Cosmetics and the Rebuilt Car

IT is interesting to note the variation in cars of the rebuilt variety. The meaning of the word is applied very flexibly. Some dealers have apparently overlooked the fact that there are a few prospective buyers who judge the real condition of a car only after they have had a look under the hood, and a glance at the visible details of the chassis.

Marred hubcaps will be noticed even by the less critical but the careful buyer will look further than the hubcaps. He will utilize the wheels to determine the condition of the wheel bearings and mountings. Getting down to the more intimate details of the chassis, the critical prospect has his eye on the alert for such items as will show the character of those who have operated or repaired the car.

Valve port plugs that have been badly treated by a cold chisel and hammer will neutralize the effects of the best engine enamel. An interrupter adjusting screw that once boasted of a hexagon head which has been rounded off by the use of the wrong tool will not increase the prospect's respect for the condition of the car. The sight of any visible nut that has been maltreated is revolting to this class of buyer and imparts that sales resistance that bad paint and a shoddy top imparts to the casual buyer. The replacement of battered port plugs, of worn off nuts and screws, and of unsightly rotten radiator hose are as efficacious and give as good an impression as a new pair of rubber heels. The things outlined are comparatively inexpensive to replace.

A car listed as rebuilt should present such an appearance that the salesman need not be ashamed to raise the hood. The marks of inward character visible under the hood should be in keeping with the efforts made to secure the impression of external refinement. A few gallons of paint and some top dressing will cover a multitude of sins but a little attention to the details of the mechanism will prevent the impression of hypocrisy.

Lowers Fordson Price $230

Henry Ford Reduces Tractor Price from $725 to $395

Tells Farmers That Decrease is Company's Contribution to Returning Prosperity

DETROIT, Mich., Jan. 28—A reduction of $230 in the price of the Fordson tractor was announced personally by Henry Ford by wireless telephone to the Ford dealers assembled at the Fordson Tractor Industrial Show in Cleveland last night. The new price is $395. In his talk, Ford said the price cut was to help bring increased prosperity to farmers by permitting use of improved methods. He said:

"It is certainly wonderful to sit here in my office and say a few words of greeting to you Ford dealers of the Cleveland territory. The radio is an outstanding tribute to man's inventive genius. They say there is nothing new under the sun, but we are constantly inventing new things, every day bringing some big improvement over the previous day's methods.

"Manufacturing operations have undergone some wonderful revolutionary changes during the past few years. We are all familiar with the big improvements in transportation methods, but the oldest industry has been the most backward in the acceptance or adoption of the new and up-to-date methods of doing things, and that is the farming industry. Being a farmer, I am vitally interested in all farm improveemnts, and, with this in mind, I have spent years of time and millions in money in the development of the Fordson tractor, which I really think is one of the biggest possible helps to profitable farming.

"As a general thing, the farmers have bettered their financial condition during the past 18 months, but the production costs of farm products are still too close to selling prices to allow fair margins of profit. What the farmer must do to put his business on a paying basis is to allow the cost of planting, cultivating and harvesting of his crops. This alone will increase his profits, and with this thought in mind it has been our constant aim to lower the price of the Fordson so that every farmer in the land could afford to own one. It is a pleasure, therefore, to announce through you Ford dealers that we have today decided that the tractor price should again be reduced, and, in considering a reduction, naturally my thought has been to make it possible for the largest number of farmers to share in the benefits to be derived through the use of our tractor, and, consequently, effective Jan. 27, 1922, the new price of the Fordson tractor will be $395, f. o. b. Detroit. This is a cut of $230 off the present price and, while in making this big reduction we have taken upon ourselves a gigantic task in the reduction of manufacturing costs, still that task, in my opinion, is not larger than the farmer's problem of today, and I am glad to do my part in bringing about a period of increased prosperity for the farmer. Your part is to carry this message to the farmer, thereby enabling him to produce more with less cost and shorter hours.

"I am glad to have had this opportunity of talking with you and you have my best wishes."

Bus Market Draws Attention General Motors Truck Co.

Detroit, Jan. 27—Two big avenues for motor truck business in 1922 will be in the augmentation of street railway service through the sale of buses to trolley companies and individual operators, and the augmentation of railroad freight handling facilities through the adaptation by the carriers themselves, of trucks for short haul work.

Special sales campaigns are being mapped out by General Motors Truck Co. to develop this market for its product in 1922. This, with the large potential market afforded for trucks by the highways projects of the year, is expected to create a volume of business which will compare favorably with truck business prior to 1921 and keep the big plant at Pontiac on close to normal production.

DURANT PRODUCTION GROWS

New York, Jan. 27—Production at the Long Island City factory of the Durant Motor Car Co. of New York is rapidly approaching capacity and 100 machines were turned out in one day last week. As originally designed the capacity of the plant was to be 100 a day but by the application of efficiency methods this can be increased, it is believed, to 150. The Lansing plant is turning out about 25 cars a day. The Muncie plant will begin production of the Durant Six for delivery to purchasers some time in February.

HARES AFTER NEW LINE

New York, Jan. 27—If negotiations which now are pending are successful, Hares Motors will take over the sale of the line of trucks made by the Traylor Engineering & Manufacturing Co. of Cornwallis, Pa. Final details of the contract have not been worked out but it is expected the plan will go through successfully in the near future.

JACKSON LOWER PRICED

Jackson Mich., Jan. 28—Prices on the Jackson five-passenger touring model have been lowered from $1,635 to $1,485. Other models remain the same.

Graham Declares Courtesy Needed Throughout Industry

Chandler Sales Head Cuts Some Sharp Points for Dealers at Rochester Meeting

ROCHESTER, N. Y., Jan. 28—"The quickest way to get rid of the poor 1921 year is to collect the profits of 1922," declared George M. Graham, vice president of the Chandler Motor Car Co., at a dinner of various sales agents throughout Central and Western New York, which was held in Rochester recently. A brighter outlook for the automobile industry is foreseen in 1922, the speaker told the visiting dealers and salesmen, for the automobile industry has stood the ordeal.

"Automobile manufacturers have not gained anything by cutting prices," Graham said, "for it takes more than a price cut to obtain sales.

"You've got to have class, you've got to have a car that carries every essential, you've got to have a car that has beauty and design, besides a price reduction, if you expect to sell," he said.

"Future Not in High Priced Car"

"The future of the automobile industry is not in the high-priced car," Graham said, but it is in the medium and low-priced car that the public is looking forward to. High taxes have hindered the automobile industry, and when economic conditions are better it will mean lower government taxes, but "the soldier bonus will put it right back again."

The used-car problem is purely a local proposition, Graham told the dealers. There are over 100,000 used-cars in existence upstate, he said, and these 100,000 furnish the best prospect list any dealer could ask for.

"If used-car dealers can make money," he said, "you can, if you buy rationally. You've got to buy right, that is all there is to it. If the prospective buyer expects deflation on new cars, his car must deflate also."

"The motor car world must adopt the department store idea," he said, "for that is what the industry needs more than anything else. A $40 or a $150 purchaser obtains the same courteous treatment in a department store, so why don't we do that here? The salesman of today, for the most part, cannot bring down his vision to the small purchaser."

BESSEMER TRUCK TO MOVE

Philadelphia, Jan. 27 — The Bessemer Motor Truck Co. is making final preparations to remove its headquarters to its new plant at Holmesburg, where the production of trucks will be undertaken on a large scale.

I. H. C. Ft. Wayne Truck Plant Sure Go

Foreign Drivers Sign for Beverly Hills Speed Drive

Public Demands New Faces and Cars for Washington's Birthday Coast Race

LOS ANGELES, Jan. 27—Sixteen famous drivers already have signed entries or indicated their intention of doing so for the annual Washington's Birthday race on the Beverly Hills speedway. The Italians, De Paolo and Bordino, have cabled their acceptances and are expected here with their cars in two weeks. Paolo has driven at Indianapolis, but Bordino has never been seen on the track in this country. Other foreign drivers have expressed a desire to come here with their 183 cu. in. cars because the Automobile Club of France has reduced the limit to 122 cu. in. De Palma, Milton, Murphy, Hearne, Miller, Sarles, Thomas, Hartz, Elliott and other well known American drivers will participate.

This will be the first important race of the year. Los Angeles outdraws every other track with the exception of Indianapolis, but followers of racing out here are calling for new faces and new cars. Although wonderful time has been made by Murphy, Milton, Sarles and the others with their "straight edge" Duesenberg cars, the public wants to see new cars, and it is for this reason that A. M. Young, manager of the local speedway, is so anxious to induce foreign entrants to come.

TO HOLD GARAGES RESPONSIBLE

Columbus, O., Jan. 28—Losses to automobile owners through the theft of parts or personal property from cars while in the custody of public garages or repair stations have been so numerous that the Ohio Automobile Assoication is getting behind a bill to be introduced at the next session of the legislature to protect such property. Attorneys are now drawing the bill and adequate protection will be given to owners, requiring the garage or repair shop proprietors to stand responsibility.

RUGGLES TRUCK PRICES

Detroit, Feb. 1.—Ruggles truck prices released Feb. 1 are: 1-ton chassis, $1195; 2-ton chassi, $1795. Only two models will be built for the present. Production which started in November has been gaining steadily and will reach 100 in January.

BAN ON TRUCKS REMOVED

Seattle, Jan. 27—A rescinding of a recent order handed down by the Washington State Highway Commission barring all logging trucks from the hard-surfaced highways of the state until June, 1922, has been obtained through efforts of the state executive committee of the Washington Automotive Trade Assn., with the assistance of Seattle motor truck dealers and other interests affected.

Rippingille Leaves Hudson To Handle Own Interests

Detroit, Jan. 21—E. V. Rippingille, assistant sales manager for Hudson and Essex for a number of years and particularly interested in sales promotion and service work for these concerns, has resigned to handle the Watson Stabilator throughout the Michigan zone. Rippingille is particularly known for his many sales promotion stunts, particularly in organizing and carrying through to a successful finish the Hudson and Essex transcontinental records and other records runs, both on the road and track, with these two cars. He has been associated with the industry abroad as well as in this country almost since its inception and recently has been devoting his efforts to the organization and establishment of the Hudson-Essex service policy.

MENOMINEE LOWERS PRICES

Clintonville, Wis., Jan. 28—Price reductions are announced on the various models made by the Menominee Motor Truck Co. of Wisconsin.

	Old Price	New Price
Model "HT," 1¼-ton	$2080	$2000
Model "H," 1½-ton	2725	2475
Model "D," 2-ton	3245	2875
Model "G," 3½-ton	4270	3800
Model "J3," 5-ton	5450	4850

CHANDLER SALES HEAVY

Cleveland, Jan. 27—A complete check made on sales at the New York automobile show by the Chandler Motor Co. of this city, has disclosed that the company's business at the annual exhibit this year was the best in the history of Chandler.

The same record has been maintained at the annual Philadelphia show, according to reports received at the company offices.

The new model brought out this year is given a large share of the credit for this showing.

FORDS DROP IN CANADA

Toronto, Jan. 27—The Ford Motor Co. of Canada has announced reductions on Ford models somewhat larger than those made in the United States. Price of the sedan is cut $60 to $930; the coupe $50 to $840; the truck chassis $40 to $575, and the touring car $30 to $535.

Year to See I. H. C. Truck Plant Running at Ft. Wayne

McCormick Tells Citizens Nothing Is to Prevent Work Starting on Factory in March

FORT WAYNE, Ind., Jan. 28—Work on the construction of the truck plant of the International Harvester Co. in this city will start on or before March 15. This is the message personally delivered by Cyrus F. McCormick, Jr., at the annual meeting of the stockholders of the Greater Fort Wayne Development Co., which was organized to erect homes to house the workers at the plant. The contracts for the erection of the truck plant here were first made in June, 1920, but the construction work was postponed from time to time owing to business conditions.

In making his announcement Mr. McCormick said that plans for the plant indicate that in time it will be the largest of its kind in the world and he also declared that action has been taken to make the buildings and grounds a beauty spot in the way of factory construction. Parkways, drives and landscaping of the grounds will be undertaken. The buildings will all be of a beautiful stucco design.

Mr. McCormick told the stockholders of the local corporation that while he did not want the action here to be regarded as an indication of great optimism as to future business conditions in the nation, the diretcors of the Harvester company had decided that all pledges made should be carried out to the letter, even though a wait of a few months more for the starting of work would be beneficial.

Much of the preliminary work in connection with the big plant has already been done. It is expected that the factory will be in operation and turning out motor trucks within a period of 12 months.

TIRE FABRIC SALES BOOM

Thomaston, Ga., Jan. 27—Twelve carloads of tire fabric were shipped to various automobile tire manufacturers in the early part of January by the Thomaston Cotton Mills, of Thomaston, Ga., officials of the company stating that unusually large orders being received for fabric indicate material improvement for the tire industry. The mills are now on a full time capacity with sufficient orders in hand to insure steady operations for several months.

WITT-WILL LOWERS PRICE

Washington, Jan. 28—The Witt-Will Co., Inc., has announced a reduction of $500 on its 1½-ton and 2½-ton trucks. The former now lists at $2250 and the latter at $2750.

Would Double Gas Mileage By Increasing Compression

Thomas Midgely, Jr., Fuel Engineer G.M.C., Urges Economy Through Mechanical Improvements

WILMINGTON, Del., Jan. 27—In discussing the economic phases of the motor fuel problem, before the Delaware section of the American Chemical Society here a few days ago, Thomas Midgely, Jr., engineer of the motor fuel section of the General Motors Corp., urged mechanical improvements. "For obvious reasons," he said, "it is of the utmost importance to make the most efficient use of motor fuel from petroleum that we can. Increased mileage per gallon may be obtained in a variety of ways. The most practical method of increasing mileage is to increase the compression ratio of our present internal combustion engine." He presented data to prove his contention that doubling the compression pressure will result in doubling the mileage per gallon. "This method of increasing mileage," he said, "has only one drawback, and that is the so-called 'fuel knock.'"

Admitting that "fuel knock" is troublesome and likely to crack the more brittle portions of the combustion chamber, thereby reducing the power, he said this can be overcome by the use of such materials as orthotoluidine, xylydine and monomethylaniline, thereby allowing the benefits from high compression to be fully realized.

GARDNER WITHOUT DEBT

St. Louis, Jan. 28—The Gardner Motor Co., in its statement as of Dec. 31, has wiped its financial slate clean. It has taken a loss of $800,000 for the year but presents a balance of $600,000 in cash and not a dollar of indebtedness. The loss on inventory for 1921 was $990,000. Organization and prepaid expenses, tools, dies and patterns all have been wiped out as balance sheet items. Buildings and equipment have been reduced from $600,000 to $400,000, and inventories from $1,700,000 to $500,000 representing cost or market. These items with the $600,000 in cash and $50,000 accounts receivable bring the total assets to $1,550,000.

The company expects to develop the south and southwest as its principal sales field. It is confident the south has turned the corner and with the markets developed on the Atlantic and Pacific coasts the company hopes for much larger sales in 1922.

USED CAR PRICES STIFFEN

Atlanta, Ga., Jan. 27—Atlanta dealers express the belief that the used car market has now hit rock bottom as to prices, and that from now on prices will gradually stiffen. Used car sales are picking up gradually and as the supply is taken by the buying public prices are expected to continually go upward until spring at least, as very few of the dealers are now taking in any used cars to speak of. Further indications that the industry as a whole is improving is noted in the fact that few if any of the dealers are making what might be termed "long trades" on used cars. At any rate, present owners wishing to trade in used cars for new machines are not obtaining bargains nearly as enticing as those many of the dealers were inclined to give three or four months ago when the industry was at its lowest ebb.

Iowa State Secretary to Ask Lower License Fees

Davenport, Ia., Jan. 28—Drastic reform in legislation fixing automobile licensing fees is proposed by Secretary of State Walter C. Ramsay, who suggests reductions of nearly 33 per cent upon the fee. Iowa, next to Michigan, has highest license fee in the union.

Present system imposes a one per cent tax upon the manufacturers' list price and an approximate rate of 40 cents a hundred upon weight of the vehicle is added. Ramsay would eliminate the one per cent assessment and establish a 75 cents a hundred fee upon weight of the car. This arrangement Ramsay points out imposes the heaviest tax upon the heaviest machine which does the greatest damage to the roads.

The proposed rearrangement would reduce the Ford license fee about $6 to an average of $7.50 year.

KANSAS CITY ALLOTS SPACE

Kansas City, Mo., Jan. 28—Drawing for space at the Kansas City Motor Show, Feb. 11-18, occurred Jan. 23, the event being characterized by a spirit of unusual selling success, and the starting point for substantial business in 1922.

The show will be held in the Overland Building, where four times the space for passenger cars and trucks has been sold, and the Jan. 23 meeting was simply for the purpose of alloting the booths.

The annual meeting for outside dealers will be held Feb. 15. Manager Peake reports that the response to preliminary announcements has been far greater than for several years, indicating a large attendance for the show from that source. Ray W. Sherman and George W. Graham will be the speakers. This will be a joint meeting for car and truck dealers and accessory men.

ROCHESTER SHOW ATTENDANCE

Rochester, N. Y., Jan. 28—An increase of 6034 persons over 1921 is noted in the attendance figures of the annual automobile show of the Rochester Automobile Dealers' Assn. which was held here last week. This year 37,118 persons attended the show while last year only 25,678 witnessed the display of cars.

Cleveland Plants Prepare For Increased 1922 Output

Working Forces Are Slowly Being Added to and Outlook Is Reported Bright

CLEVELAND, Jan. 28—Production schedules for the year 1922 that have been worked out by Cleveland makers of automobiles contain convincing proof of extreme faith in the prospects of the industry for the next 12 months.

The 13 factories here have scheduled for the present production figures that will run the total many thousands of cars in excess of the number turned out in the year just ended. Virtually all of the companies interviewed have planned to augment their working forces, while some in recent weeks have taken on employes. The first yearly upward movement in the trade is felt here after the New York and Chicago shows and Clevelanders look to the automobile industry to greatly relieve the employment situation in the city.

Grant will build approximately 7,000 cars this year, says George C. Hubbs, vice president and general manager, who recently returned from a tour of the country. This organization by February 1 will have more than 100 direct sales connections.

Templar did not allow the recent fire to halt production and it has planned to build 5000 cars. M. F. Bramley, president, says that 500 additional workmen will be employed during the early spring months.

Winton is busy on plans for a larger year than 1921, says H. J. C. Miller, sales chief.

The **Stearns Co.** business was but 10 per cent less for 1921 than in 1920, while 1922 plans call for an expansion in production of more than 10 per cent.

The output at the **Jordan** plant has been doubled since the new model was announced. Plans for the new year are far in excess of those made in the previous year.

George M. Graham, former vice president of the Pierce-Arrow Motor Car Co., who came to **Chandler** to take charge of sales, service and advertising, says that plans for 1922 include an intensive development campaign in all directions. Chandler is expected to employ its full quota of workmen early this year.

The **Cleveland Automobile Co.**, makers of the Cleveland six, has been occupied with the new lines of cars. This factory is expected to start shortly on a production schedule of around 15,000 cars for the new year.

At **Peerless** plant a new organization is functioning smoothly and while minor refinements have been made this line will not be changed materially.

The **White Co.** has planned to eclipse by a wide margin the record for the last 12 months.

Plans are under way to lift the receivership of the Ferris car which was imposed last summer.

The **Kurtz Automatic** is to turn out 600 cars in 1922. This is the city's baby automobile plant. The plant has been operating during 1921 on a car a day basis. The new **Marsh** factory that has been in course of construction is expected to get into production on a light four early this year.

Philadelphia, Jan. 27—Manufacturers of automobiles are giving sub-contractors orders to speed up production, in anticipation of an improvement in business by spring. The effect has been felt here and one large stamping shop is producing a record number of bodies—400 a day—for Dodge Bros. The E. G. Budd Manufacturing Co has taken on 500 extra men in the last few days in its body-making plant. The shops are now running at 80 per cent of normal, with some divisions on full time and a few on overtime.

Orders since the first of the year call for substantial increases in daily production. The Studebaker Co. has ordered deliveries of 150 bodies a day, with prospects of an increase soon. Orders for fenders for the new type 61 Cadillac have increased and Overland bodies also are being produced is greater number.

Two reasons are advanced for the sudden turn in production demands. Manufacturers, even the largest, it is said, had not increased orders prior to the automobile shows, desiring to close the year with small inventories, but since the shows started, busines received a sudden impetus and quick orders for increased production became imperative. The price reductions, which may be final for the year, and which have met with good responses from the public, is the other reason to which the inflow of orders is attributed.

ROAD BUILDING BIDS DROP

Columbus, O., Jan. 28—Cost of road building in Ohio has taken a tremendous drop, according to figures gives out by the Ohio highway commission following the opening of bids on five highway projects recently. The estimated cost of the five jobs in question was $414,872, while the aggregate of the low bids received was $321,475, showing a decline of $93,000 from the estimate made by the engineers attached to the department. In the opinion of some, the end of price cutting, especially on materials, is not yet is sight.

BOWSER ON FULL TIME

Fort Wayne, Ind., Jan. 28—Business has increased so considerably at the local plant of S. F. Bowser & Co., Inc., manufacturers of gasoline tanks and pumps, that it has been announced by D. A. Corey, the manufacturing superintendent, that the factory which has for some time been running on part time, will be placed on full time.

New Unit Parts Depots Are Now Located in 34 Cities

Distribution Agencies in Smaller Centers Will Be Named Early in Year

DETROIT, Mich., Jan. 23—Central parts distributing depots of the new unit parts group have been located in 34 leading cities of the country and with the addition of some half dozen more, the main distributing organization will be complete. The companies and cities thus far selected are:

Atlanta, Motor Parts Corp.; Baltimore, Quaker City Motor Parts Co.; Boston, Campbell Motors Corp.; Buffalo, Unit Parts Corp.; Charleston, S. C., Carolina Motor Parts Co.; Chicago, Standard Unit Parts Corp.; Dallas, Motor Parts Depot; Denver, Gall Auto Specialty Co.; Des Moines, Standard Motor Parts Co.; Detroit, Automotive Parts Co.; Harrisburg, Pa., Quaker City Motor Parts Co.; Indianapolis, Central Motor Parts Co.; Kansas City, General Auto Parts Co.; Louisville, Edinger Motor Parts Co.; Los Angeles, Colyear Motor Sales Co.; Milwaukee, Standard Unit Parts Corp.; Minneapolis, Baldwin Service Co.; New York, Chadick Delamater Corp.; New Orleans, Standard Motor Parts, Inc.; Omaha, Omaha Motor Parts Co.; Philadelphia, Quaker City Motor Parts Co.; Pittsburg, Superior Motor Parts Co.; Portland, Ore., Colyear Motor Sales Co.; Salt Lake City, Mendenhall Auto Parts Co.; San Francisco, Colyear Motor Sales Co.; Seattle, Colyear Motor Sales Co.; St. Louis, Authorized Motor Parts Co.; Toledo, Automotive Parts Co.; Columbus, Automotive Parts Co.; Cincinnati, Automotive Parts Co.; Cleveland, Automotive Parts Co.; Richmond, Ind., Standard Parts Co.; Spokane, Colyear Motor Sales Co., and Memphis, company's title not chosen.

Companies in Plan

The companies whose products will be distributed through the parts depots are Continental Motors Corp., Timken-Detroit Axle Co., Brown Lipe Gear Co., Borg & Beck Co., and Spicer Mfg. Co.

Each of the unit parts depots will be financed by local capital entirely and will be operated according to conditions existing in the different localities. Contracts have been signed for handling the distribution of the unit makers' products, and in turn they will sign subdealers who will handle the units parts in the smaller cities of the 40 districts.

These contracts in the main only require that the station maintain an adequate supply of parts at all times, the supply to be based on the population served and the total registry of cars in the districts. Prices are set by the factory, freight variations causing any difference that may exist in prices in any section.

The business of signing distribution agencies in the smaller cities will be carried through during the early months of the year and by April factory parts will be available in any section of the country in five to six hours.

CASE PLOW'S STATEMENT

Chicago, Jan. 24—The annual statement of the J. I. Case Plow Works for the 15-month period ending Sept. 30, 1921, shows a total loss before federal taxes of $2,985,797, as compared with a surplus of $673,365 before taxes for the year 1920. The statement reveals the severe curtailment of implement buying by farmers.

The deficit recorded in the report is due to the fact that it covers the period in which "freezing" of financial channels occurred. After an inventory shrinkage of $1,244,543 in adjustment to current replacement values, inventories stood at $3,890,600.

The company was severely caught by unexpected trade conditions existing during the period. For the first half of the year orders were very heavy. From June to February more business was written than the entire volume of the previous year. With a weak volume of unfilled orders the company bought supplies at current prices. When the sudden trade reverse came the company was unable to deliver a large part of the orders and heavy inventories were taken. The company started its new year, however, with inventories written to market replacement cost.

AKRON TIRE SALES NEAR PEAK

Akron, O., Jan. 27—Tire production in Akron is steadily mounting. Many companies report the heaviest production in their history. Labor efficiency has increased from 40 to 58 per cent in all factories. More tires are being built daily in Akron than at any previous time with the exception of about three months during the high mark of the tire industry's unprecedented spurt and peak prosperity in the spring of 1920.

A survey of the industry made by Akron's business leaders shows that it is beyond its pre-war peak basis, and is closely approaching the old peak of 1920. Production now exceeds 100,000 tires daily, with all companies reporting increasingly heavy spring orders from all parts of the United States and from many European points.

DELAWARE GAS TAX

Wilmington, Del., Jan. 27—Although the Delaware legislature does not meet until next year, a bill is being drawn to tax gasoline for the benefit of the state, with the idea of introducing it at the next legislative session. It is proposed to impose a tax of two cents a gallon, the proceeds to be applied to the construction of new roads.

Trade Rally Cleveland Feature

Dealers' Meetings Feature Cleveland Automobile Show

Large Volume of Business Developed by Wide-Awake Methods —500 at One Meeting

CLEVELAND, Jan. 27—The twenty-first annual Cleveland automobile show set a new attendance record —25 per cent ahead of last year. It established also show sales records greater than last year's for a few particularly well established dealers with unusually active sales staffs and cars of good general standing. Several dealers in well established cars, but who as merchants have not earned reputations as high as some of their competitors, had only fair sales. And obscure and semi-obscure cars, with dealers only casually known to the public, sold little or nothing.

Cars of sterling reputation whose price reductions in the past year were not so frequent as to set gossipy tongues a-wagging had the best patronage.

Annual Trade Rally

Despite the concentration of sales, the show uncovered a wealth of deferred business in all classes of automotive merchandise. Prospect lists were longer and looked more like "pay dirt" than any obtained at shows in several years. The show gave certain evidence of a more than fair volume of spring business for dealers who go hard after it.

To assist the trade in getting this business the Cleveland Automobile Dealers and Manufacturers Assn., assisted by the Cleveland Automotive Trade Assn., the former conducting the show and the latter taking in a great many garagemen, arranged two big meetings which brought the trade in from the greater part of Ohio.

One was the annual trade rally, held Monday, after the show had been open two days. Five hundred passenger car distributors, dealers and their salesmen, from Cleveland and all northeastern Ohio, attended it. The other was an automotive equipment meeting, presenting the "Ask 'em to Buy" idea, and five hundred men attended that meeting, too, coming from car sales and truck sales establishments, equipment stores, garages and jobbing houses from all sections of Ohio.

There were smaller meetings also, arranged by car and truck distributors for their retail representatives all through the Cleveland territory.

Distributors and their executives commented about the new attitude of the men who came in from the outside cities and towns. They didn't stay in town all the week and they did not do much skylarking. The past year's trials seemed to have taught them that there was not much use of their coming in to Cleveland just to see the show. They came for the meeting, believing the assurances of the Cleveland trade that they would get something out of them. They got it, and they went back to work.

Richard H. Lee, vice president of Lord & Thomas, Chicago advertising agency, and Percy E. Chamberlain, educational worker in the trade throughout the country, were the principal speakers at the trade rally.

Chamberlain presented briefly his thoughts on merchandising, all the way from the grease hound up to the president—"not from the president down." He showed how the salesman and the service man must be doing the same thing, doing their best to serve customers, if dealers are going to get and hold the confidence in themselves which is a necessary supplement to confidence in their cars in the present competitive market. He condemned cutting of sales costs by "using the axe" on sales staffs, urging, rather, thought and action by dealers to make their selling efforts get results. He called on dealers, no matter how small their organizations, to push trivial details aside long enough every day to sit down and think out means of building throughout their organizations, in salesroom and shop, understanding of the aims of the organization in its relations with the public. Merchandising, as Chamberlain defined it, is not just the use of men and equipment with which to sell, but a spirit, with friendliness and fair play as its foundation.

Lee thrilled his audience with several stories of things accomplished by advertising, of sales made in the face of supposed depression by speaking confidently, optimistically to people with power to buy, of whom he said there are a surprising number when one really goes out looking for them.

Citing the country's per capita wealth, greater than at any time prior to 1917, Lee told these Ohio automotive men: "If you must tell someone you can't sell, tell yourself, and don't disturb the rest of us and the people who are going to buy from us, because it isn't so."

Called Temperamental

Lee, who has been in the automobile business, called it temperamental. It changes its tune too frequently, he said. "Let's quit trying to sell differentials and crankshafts and go back to selling motor cars as vehicles that will take people out to see new things and breathe new air and think new thoughts," he urged. "Let's sell the motor car, all of us, instead of saying things about the other fellow's car that set people suspecting all cars; let's sell the motor car and the automobile industry and when there is more business for the industry we'll all get our share."

Lee put the particular make or design of car after two other things in his discussion of present market conditions. He said that:

First, a buying spirit, and

Second, **confidence in the dealer, would sell cars today, above all other things.**

And he said the dealer's and salesman's attitude have much to do with creation of buying spirit or destruction of it.

"Some folks sneer at optimism," Lee concluded, "but I'm an optimist and I've made it pay—in the cash drawer."

The automotive equipment meeting, which brought together employers and employes in sales and service organizations from all over Ohio, presented Ray W. Sherman, merchandising director of the Automotive Equipment Assn., and the film, "Ask 'em to Buy." Sherman's talk and film are not new to MOTOR AGE readers, but they were new to this Ohio audience, an audience which hungrily absorbed the undisputable facts set forth about the profit opportunities in automotive equipment. Sherman offered figures indicating that there is $2,500,000 potential automotive equipment business in the Cleveland territory and $15,000,000 in the state—a business possible if only $25 worth of equipment is sold for every car. The talk and film showed how easy it is for men or women, boys or girls—for anyone working in a dealer or garage establishment—to sell equipment by asking people to buy it, and judging by the conversations in the meeting room and the hotel lobbies after the meeting there are a lot of cars in Ohio which are going to look better, run better and give their owners more satisfaction before long because of the selling efforts of these men who came to the meeting and others to whom they are going to tell the story they listened to with such great enthusiasm.

Sherman Addresses Dealers

Howard M .Dine, of Canton, president of the Automotive Equipment Assn., introduced Sherman after he had taken a few minutes himself to tell of profits made by dealers who have already taken up the "Ask 'em to Buy" idea.

B. W. Ruark, of Pittsburgh, Pa., head of the Pittsburgh Equipment Co., classed minimum investment in stock and frequent re-ordering, to prevent loss of sales, and rapid turnover, as essentials to successful retailing of automotive equipment. He made a ringing address showing how spirited ,aggressive sales effort will sell anything in any kind of times.

The meeting was historic in Cleveland because it brought the Cleveland Automobile Manufacturers and Dealers Assn., which conducts the show, and the Cleveland Trade Assn. together in their first joint effort for the good of the trade .

1250 Dealers at Milwaukee Show

Milwaukee Show Inspires Dealers for Year's Sales

1200 Automobile Agencies Represented from Wisconsin and Upper Michigan—Year's Outlook

MILWAUKEE, Wis., Jan. 27—Besides serving its definite purpose of crystallizing the interest of the people of Milwaukee and vicinity in the 1922 offerings of the passenger car factories of the United States at a time when their interest has been dulled by severe weather conditions and the strain of holiday disbursement, tax-paying time, etc., the Fourteenth Annual Milwaukee show played a heavier role than perhaps ever before in achieving its greater object—from a strictly trade viewpoint—of putting new life and vigor into the dealers of Wisconsin and upper Michigan and getting them set for the admittedly hard battle that confronts them in the prosecution of business in this new year of complex problems and difficulties.

Milwauwee Industrial Center

Milwaukee is the only large city in Wisconsin. It has 525,000 population, compared with about 55,000 in the second largest city, namely, Racine, which is 25 miles away. Consequently, it is the big wholesale distribution center of the state. In addition, by geographical favoritism, the entire Upper Peninsula of Michigan is accepted as a logical part of Milwaukee wholesale trade territory. This is true of dry goods, boots and shoes, groceries, clothing and other principal necessities, as well as of motor cars, trucks, tractors and farm operating equipment.

While from 15 to 20 of the larger centers within the state and the Upper peninsula hold local shows in February and March, the Milwaukee show serves the same purpose to Wisconsin and northern Michigan dealers that the New York and Chicago national shows serve to the distributors and dealers of the entire country. Through the Milwaukee show, the distributors of Milwaukee talk to the dealers of Wisconsin and Upper Michigan just as through the national shows the manufacturers talk to the distributors of the nation.

There are 2150 established dealers in Wisconsin and 350 in northern Michigan, and of these 2500 retailers approximately 50 per cent attended the Milwaukee show, judging by the registration of members of the trade and attendance at the annual banquet and conference of the Wisconsin Automotive Dealers' Assn. held during the show.

The Milwaukee Automotive Dealers' Assn., which conducts the show, consists of about 85 per cent distributors handling the state and peninsular territory and 15 per cent dealers having possibly a sectional distribution contract or holding merely local dealer rights in the city and county of Milwaukee. All of the 85 per cent of distributors handle Milwaukee and county of Milwaukee. All of the 85 per cent of distributors handle Milwaukee county retail sales, either directly or through subsidiary concerns. This situation gives the Milwaukee show two distinct fields to work, namely, the distributers work on the dealers of Wisconsin and northern Michigan, and as local dealers they work on the people of Milwaukee and vicinity.

Like all of the 13 annual winter shows that have preceded it, the 1922 show was staged as a spectacular and impressive appeal to the owner and prospective owner. But behind this palatial setting is to be found the occasion which is provided to appeal to the dealer trade. Obviously, it would be extremely difficult, if not impossible, to attract to Milwaukee so many dealers at one time as come to the annual show, where the show feature is absent. Some of the dealers are accompanied by prospective customers who want to see before they buy, but usually the dealer comes less to sell a car or two than to meet his distributor, talk over business, rub elbows with his fellow dealers from all parts of the state and peninsula, and get a line on views and opinions respecting possible business generally and sectionally. If the dealer does not come for inspiration, he gets it nevertheless, for the exposition such as Milwaukee stages each winter is thoroughly inspirational, and the inspiration is accentuated by the many events arranged in its connection to appeal directly to the dealer.

It was easily discernable that the temper of the Wisconsin and northern Michigan trade is distinctly serious-minded and sober, in contrast with the usual spirit of gayety that made most past shows a holiday for the dealers more than a business trip. This change was noticeable a year ago, for already then the light-hearted attitude born of the war boom was giving way to the strong need of getting back to earth. But the experiences of the past year have had the most sobering effect of perhaps any single year since 1913 or 1914. True, 1917 and 1918 were "hard years," but only because production was officially restricted because of the war, and dealers had to turn more prospects away than they accepted as customers.

A complete reversal of the situation has taken place and while it was generally appreciated during most of 1920, it was not until 1921 that some sort of a readjustment within was made. This apparently has not been completed, but opinions expressed at the show indicate that it may now be reasonably expected that it is being hastened by a definite beginning of a recovery of general business. Since rises and declines in the general situation are reflected probably more rapidly in the motor car industry than any other, confidence is expressed that more cars will be sold in Wisconsin and northern Michigan in 1922 than last year, but it will be just as hard to accomplish this as it was in 1921.

Sales resistance has been overcome to

View of main arena and special mezzanine gallery, Milwaukee Automobile Show

the extent that people again desire to buy, but it is as strong as ever, if not more so, with respect to the financial ability to buy.

Discussions with representative dealers indicate that Wisconsin is perhaps more fortunate than most other states in regard to the financial ability of the average individual, since this is not a single-crop state, and in addition to diversification of crops, the agricultural regions have the further advantage of a huge dairying industry, which, according to Federal census reports, has made Wisconsin the premier dairying state in the Union, a place formerly held by New York. Prices of dairy products have not suffered the same demoralization as grain prices. There is a still further advantage in the fact that money for dairy products comes into farmers' hands at least once and sometimes twice a month, while crops are "cashed in" but once a year.

In 1921, there were absorbed in Wisconsin approximately 44,000 passenger cars, according to registration records. In 1920 the gain over the previous year was 53,000; in 1919, 316,200; in 1918, 25,500; in 1917, 48,886; in 1916, 35,900; in 1915, 26,650; in 1914, 18,600; in 1913, 10,000, and in 1912, 18,500.

Wisconsin May Sell 55,000

On the basis of past experience and present facts, with future prospects conservatively estimated, it was said at the show by keen analysts among distributors that Wisconsin ought readily to absorb 53,000 to 55,000 new passenger cars in 1922, which would be equal to or above the 1920 sales record.

One of the principal inspirations to the dealer trade of the territory, outside of the show proper, was the annual banquet and round table conference on merchandising and service of the Wisconsin Automotive Dealers' Assn., under the sponsorship of the Milwaukee A. D. A. There were three principal figures injecting new life. Harry G. Moock, of St. Louis, spoke as secretary of the national association. Ray W. Sherman appeared as merchandising director of the Automotive Equipment Assn. The spokesman of the passenger car manufacturers was Edward S. Jordan, president of the Jordan Motor Car Co., Cleveland.

Considering the Milwaukee show of 1922 from a retail selling angle, it is gratifying to know that the attendance was larger than last year, interest was stronger, and actual sales booked larger. More people visited the exposition because more persons are interested in buying, comparing real interest with last year and two years ago. While the financial ability to buy is perhaps not quite so good, nevertheless it is believed that the many new ways and means devised by manufacturers, distributors and dealers to assist customers in financing their purchases will achieve even better results than if more people were able to lay down the purchase price at once.

Industry's Leaders Gather Around Ford in Lincoln Deal

General Motors and Studebaker Rumored to Be Interested, but Reports Officially Denied

DETROIT, Jan. 28—Henry Ford's purchase of Lincoln Motor Co. on Feb. 4, which is considered in this city to be practically a certainty, promises to bring in its train one of the greatest reassemblages of executive talent that the industry has known.

Throughout the deal Ford has acted with the almost certain knowledge that the men he requires to operate the property are willing to join him. Several consultations have been held at which the views of these men on the operation of the plant have been evoked and Ford is said to be thoroughly in accord.

The influence of the Lelands in the new control will be principally nominal, though it is definitely known that they will have a place in the new organization. There will be a new president and general manager and production will be in the hands of an executive of the Ford school. The sales will come within the purview of one of the highest trained specialists in the industry.

That there will be no bid for the property from stockholder interests is gleaned from the fact that the heaviest holders are content to accept a stock loss to realize on their notes. The possibility of a General Motors bid, suggested in some quarters ,canot be traced to any hint by the corporation itself. The Studebaker Corp. has made quiet investigations.

BOSCH'S NEW SALES PLANS

Springfield, Mass., Jan. 29—At a meeting of more than 50 sales managers and agents of the American Bosch Magneto Corp. Jan. 17 to 19, the concern's new selling arrangements were further perfected. It is said the sales force will comprise more than 2,000 members, the new policy being to have a large number of agency dealers in close relations with the concern. Engineering and production specialists are being assigned from the factory force to develop the sales end, which will have zone centers at New York, Chicago, Detroit and San Francisco, each with its factory branch manager. In extending its line of motor accessories, it is said one of the main ends is to give greater efficiency to cars already in use.

PREMIER STARTS REFINANCING

Indianapolis, Jan. 29—The Premier Motor Corp. yesterday filed a blanket mortgage for $60,000 to the Fletcher-American Bank here to secure a temporary bond issue of $60,000. M. A. Whipple, vice president, made the statement that this temporary bond issue is to be used to pay county, state and federal taxes, and to conserve the working capital. This is but a preliminary step toward the refinancing plan now actively under way. The last obstacles to refinancing are now removed and the prompt consummation of the plan is expected. A definite announcement of these measures may be expected soon, according to Whipple and I. E. Schaeffer, secretary.

CORRECTION

New York, Jan. 28—The statement was made in the Jan. 19 issue of MOTOR AGE that an announcement had been made by Colonel William Guy Wall, vice president and chief engineer of the National Motor Car & Vehicle Corp., of Indianapolis, that Columbia prices had been guaranteed to April 1. This obviously was an error, as the guarantee referred to the National cars and not to the product of the Columbia Motors Co., which has no connection with National. The announcement of the National guarantee was made by the Poertner Motor Car Co., which also is the Metropolitan distributor for Durant cars.

MINIMUM LOAD HEARING

New York, Jan. 28—The traffic department of the National Automobile Chamber of Commerce has been informed that a hearing will be given in Chicago on Feb. 1 by the Transcontinental Freight Bureau on a proposal to increase the minimum loadings of freight cars carrying passenger cars and trucks to California. The railroads now contemplate raising the present special minimum to the regulation classification minimum. If this is done, it will considerably increase the cost of transporting motor vehicles to the Pacific coast.

U. OF I. STARTS TRAINING

Ames, Ia., Jan. 29—The Department of Mechanical Engineering of the State University of Iowa announces a night shop course for garage mechanics and others which began Jan. 16. Instruction will be given on three evenings each week for nine weeks, from 7 to 10 p. m. The course will comprise 81 hours, of which 63 hours will be given in machine shop and 18 hours in forge shop.

CHANGE ASSOCIATION NAME

St. Louis, Mo., Jan. 28—At a meeting of the St. Louis Automobile Manufacturers' and Dealers' Assn. recently, the members voted to change the name of the association to the St. Louis Automobile Dealers' Assn.

NAMES CAUSE CONFUSION

Danville, Ill., Jan. 29—Similarity of names has caused confusion to the Automotive Body Co., of this city, by lending belief to the report that there is connection between the local concern and the Ohio corporation of Cleveland of the same name. There is no connection between the two concerns.

MARTIN-PARRY BRANCHES

Detroit, Jan. 27—Martin-Parry Corp. has located a factory branch in Detroit which will be one of 29 similar branches which the company is now opening throughout the country. The purpose of the branches, in addition to handling sales of the commercial bodies of the company, is to give immediate service on replacements of parts of the bodies.

The same personnel will continue, A. F. Schoof as service manager and C. W. Gracey as sales manager. R. P. Henderson, vice president of the Martin-Parry Corp., will make his headquarters at the Detroit branch.

Branches in addition to Detroit thus far located are in Boston, New York, Buffalo, Chicago, Atlanta, Dallas, Houston, San Francisco, Kearny, N. J., St. Louis, Kansas City, Cleveland and Detroit. The remaining branches will be located during 1922.

COLUMBUS SALES IMPROVE

Columbus, O., Jan .28—A decided improvement in the demand for passenger cars has been noted by Columbus dealers and jobbers dating from soon after the middle of January. This is attributed partly to the successful New York show and also by the better industrial conditions which are prevailing. The bulk of the demand is for cars ranging in price from $800 to $1500. Yet there is a fair demand for higher priced cars and in fact all classes of vehicles are showing improvement.

Trucks are still a little slow, but a better demand is expected in the spring. There is only a fair demand for the lighter type of delivery wagons.

PHOENIX STEAM TRACTOR

In the Jan. 5 issue of MOTOR AGE the bore of the engine used in the Phoenix Steam tractor was given as 3 1/3 in. Also it was stated that for starting or pulling out of a hole the low pressure cylinder could be simplified. This is a typographical error, as the word should have been simpled, which is the term used with a steam engine when it is not operating as a compound engine.

LOCKPORT DEALERS ORGANIZE

Buffalo, Jan. 28—An organization of automobile dealers has been formed at Lockport, with William Swyers as president, Alfred Oldham, secretary, and George Timkey, treasurer. The organization, which will be known as the Lockport Automobile Dealers' Association, will give its first attention to the used car situation in its community.

TEXAS SALES MORE BRISK

Dallas, Texas, Jan. 27—There appeared to be a continued improvement in the automobile business in Texas this week. Dallas retailers found sales five per cent better than the previous week and Fort Worth dealers were selling ten per cent more. Houston retailers said the increase was about five per cent over the preceding week and Galveston said business was holding its own. Panhandle dealers were selling more cars and trucks and Waco retailers reported slight increases. Retailers in a half dozen small towns in east Texas said business showed a decrease. There had been an increase in the sale of tractors during the week, Dallas dealers and those of Houston and Amarillo said. The accessory business was strong.

"Service," Keynote to 1922 Sales

KANSAS CITY, Mo., Jan. 28—"Service," said J. W. Perry, president of the Commerce Trust Co., is to be the keynote for success in the motor car business in 1922.

"You'll have to sell more service," he said. "Your business is getting down to the foundation of service on the cars in the hands of owners.

"I'm in favor of every man, banker, lawyer, doctor, laboring man, in this country having a car—under certain conditions. We can't get away from it—every man's heart is set on owning a car.

"But you dealers must look, for prospects, not to the man who can afford to pay for a car, but to the man who can afford to maintain it. You'll find your own best results, as well as the most pleasure in your business, when you sell only to the men who are going to be able to maintain their cars."

SALT LAKE ACTIVITIES

Salt Lake City, Utah, Jan. 27—At the annual meeting of the state association held in the Commercial Club the old board of directors were re-elected with the exception of Fred Sharman, who was not a candidate this year. His place was taken by C. J. Simpson. An advisory council, consisting of members living outside Salt Lake City, was elected, it being felt that out-of-town members should have some voice in the management of their organization.

HOOSIER TRADE BACKS SHOW

Indianapolis, Jan. 27—The Indianapolis Automobile Trade Assn. elected new officers for 1922 yesterday with Homer C. Lathrop, of Lathrop-MacFarland Co., president; R. H. Losey, of the Losey-Nash Co., vice president; A. W. Hutchinson, of the Detroit Electric Sales Co., secretary, and L. S. Shoup, of the Oakland Motor Car Co., treasurer.

John B. Orman continues as manager of the association and was given free rein to make the automobile show of March 6-11 the biggest ever held here. According to President Lathrop every exhibitor who has asked for space thus far wants more than he had last year, and the prospects for the spring exhibition were never brighter.

BETHLEHEM SHOW COMING

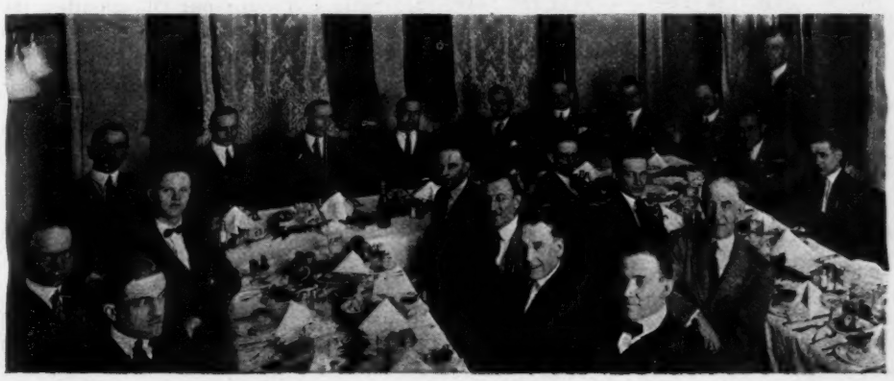
Bethlehem, Pa., Jan. 28—Under auspicious circumstances the Bethlehem Auto Trades Assn. recently at its annual meeting and banquet pointed toward their 8th annual automobile show, which will be held at the Coliseum the latter part of February.

Norman S. Ludwig was elected president, succeeding Robert Shimer, who was not a candidate for re-election. Other officers elected were F. W. Thomas, vice president; Howard Rader, secretary and treasurer; John S. Heller, corresponding secretary, and the following board of governors: James A. Hart, chairman, and W. O. Bailey, R. I. Sterner, Philip Vooz and Frank Leibert.

OVERLAND DEALERS AT BUFFALO

Buffalo, Jan. 27—The annual automobile show luncheon given by the Willys-Overland Co. to its dealers and distributors here was largely attended. At least 125 of the Willys-Overland representatives listened to interesting and beneficial talks on sales by C. B. Wilson, vice president of the Willys-Overland Co. in charge of its various plants in Toledo, Elmira, Elyria, and Pontiac; E. C. Barber, general sales manager of the corporation; W. L. Colt, division manager, and Nelson A. Beardsley, manager of the Buffalo branch, also spoke. In welcoming the dealers Colt said "every one had reason to feel optimistic over the future."

Motor Tool Specialty Co.'s branch managers at annual banquet, Chicago, Jan. 12



CONCERNING MEN YOU KNOW

Ralph S. Wiltrout has been appointed general sales manager of the Ogren Motor Co., Milwaukee.

E. R. Bowen has been appointed sales manager of the Avery Tractor Co., Peoria, to succeed C. E. Bronner, who resigned.

John Manser was elected president of the Antigo Tractor Corp., Antigo, Wis.

Moses W. Taylor, president of the Taylor Motor Co., Salt Lake City, Utah, died recently at his home in that city.

R. Norman Miller has been engaged as director of sales of the new Stewart Storage Battery Co., Marshfield, Wis.

L. E. Salmon has been appointed New York representative of the Cleveland Crane & Engineering Co.

P. E. Chamberlain, specialist on automotive dealers' troubles, is having great success on his lecture tour through the east.

Percy Ford, Chicago speed merchant, has been elected vice president of the Siegel Auto Service Co., Chicago.

J. P. Oliveau has been appointed chief engineer of the Mercer Motors Co., Trenton, N. J.

Frank Pietsch has been appointed sales manager of the Kelly Springfield Motor Truck Co., according to announcement made tonight by general manager E. O. McDonnell.

Harry Hamilton Brown, formerly assistant to the vice president of the Studebaker company, has severed his connections with the Columbia Motor Co., where he was engaged as district sales manager.

Geo. W. Cushing, advertising manager of the Hudson Motor Co., has resigned to become affiliated with Barton, Durstine & Osborn, Inc., an advertising agency at Buffalo.

P. E. Sands, president of the Sands Motor Co., Seattle, was this week elected president of the Seattle Motor Car Dealers' Club. H. P. Grant, president of the Seattle Automobile Sales Co., was elected vice president; V. C. Force, secretary-treasurer.

George H. Money, for eleven years general purchasing agent of the Federal Rubber Co., has resigned to engage in other business and has been succeeded by C. A. Walvoord.

James W. Jackman, New England distributor for the Westcott line, and also Eastern distributor for the Folberth Wind Shield Cleaner, died at Boston yesterday, following a brief illness which started at the New York motor show.

Julian S. Friede has resigned his position as body engineer with the Moon Motor Car Co., of St. Louis, to enter the retail merchandising business in Texarkana, Texas."

Gregory Flynn has resigned as vice president and director of Edward A. Cassidy, Inc. He went with that company four years ago from the Rajah Auto Supply Co.

W. Y. W. Rabb will sever his connection with the Pierce-Arrow Motor Car Co., Buffalo, early in February, to take up foreign trade promotion in New York and Buffalo.

A. A. Oberg, formerly with the Pacific-Nash Co., Ogden, Utah, has been appointed manager here for the Madsen-Farrer company, distributors of the Paige cars and trucks.

John C. Hill, formerly export manager of the Westcott Motor Car Co., Springfield, O., has become associated with the Maxwell Motor Sales Corp. and Chalmers Motor Car Co. as special sales representative in foreign fields.

Councilman Clarence S. Hastings, Middletown, Conn., for many years connected with the Russell Manufacturing Co., manufacturers of brake linings, webbing and the like, is dead at his home here, following a nervous breakdown.

L. J. Barrett has been elected director of the St. Paul Automotive Trades Association to represent the battery section. S. B. Dean has been selected director representing the accessory division.

N. C. Berrend, several years identified with the automobile accessory business and most recently sales manager of Jorgenson Manufacturing Company, Waupaca, has joined the Burns-Hall Advertising Agency, Milwaukee, where he will specialize on automotive accounts.

O. H. McCornack has been elected vice president of the Hudson Motor Car Co., Duluth, Minn.

C. W. Hadden, actively connected with the Minneapolis Steel & Machinery Co., since 1917, has been made assistant to president W. R. Wilson of the new Maxwell-Chalmers organization in Detroit.

Fred G. Anderson, Olympia, Wash., was recently elected president of the Thurston County Automotive Trades Assn., with L. J. Anderson for vice president.

John Barr Attends Show In Locomobile Built In 1899

Chicago, Jan. 25—John Barr of Dayton, O., attended the Chicago Automobile Show as a guest of the management because he owns a Locomobile of 1899 manufacture that is in good condition.

Recently the show management offered a free trip to the Chicago show for the owner of the oldest car in good condition that was a regular manufacture of an exhibitor at the show at the time the car was produced. More than 200 entries for this competition were received, but most of these were cars manufactured in 1901 and 1902. Several very old cars were reported that were built by non-exhibitors at shows. Oldsmobiles and Cadillacs were the chief entries. In reaching the decision, members of the award committee found much difficulty in verifying manufacturing data at the factories, but in the end there appeared to be do doubt that Barr's car was the oldest reported.

Louis Disbrow never frowned so fiercely; Barney Oldfield never gritted his cigar more determinedly than when driving in the spectacular race of these old cars staged in Chicago preliminary to the Chicago Automobile Show.

Disbrow was at the rudder of a 1900 Oldsmobile and Barney guided the destinies of the earlier Locomobile.

The first race was called off because some of the enthusiasts grew so excited they decided to add man-power to the rear of the automobiles. The second race was entirely above board. Barney scorched his tires trying to zig-zag more power out of his car than was ever put into it; Disbrow just exuded will power into his car, with the result that when the white flag dropped, both crossed the tape together.

The two cars, the Locomobile and the Oldsmobile, won respectively first and second place in the final awards, out of 200 entries. Twenty-one Oldsmobiles, the largest of any make, were passed upon by the judges, together with the winning Locomobile and three Cadillacs. Incidentally, the Oldsmobile was the oldest gasoline car entered, as the Locomobile is a steam power car. All gasoline cars entered were one cylinder cars.

The seventh and the ninth Oldsmobiles manufactured, still running, were among the interesting entrants of Oldsmobile, the former owned by W. F. Moellenberndt, Colorado Springs, Colo., a 1900 model, and the latter owned by Carl Snodgras, Idaha Falls, Idaho, also a 1900 model.

Head of English Overland Disappointed in N. Y. Show

Newly Made Baronet Expected Marked Mechanical Improvements in American Cars

NEW YORK, Jan. 28—Sir William Letts, managing director of Willys-Overland-Crossley, Ltd., is receiving the congratulations of his American friends on having been made a baronet. The title of "Sir" was awarded him after he sailed for this country some three weeks ago.

Sir William came to the United States to place orders for a large supply of materials for the Overland car which is being assembled is England. The orders are being placed in anticipation of the substantial spring business which now seems certain.

Conditions in the automotive industry in England are similar to those which prevail in this country, but Letts said Englishmen could not conceive how Americans could feel that they were in the midst of hard times when they have "all the money in the world," and when their taxes are only a fraction of those paid in other countries, especially England.

The New York automobile show did not particularly impress Sir William. He said he was unable to find anything really new in a mechanical way and that he was much disappointed in this respect, although he found improved designs in body models. He was of the opinion that the Olympia show was much more interesting than that held in New York.

Letts spoke with pride of the Overland car produced by the English company and said that it had been designed to find favor with English buyers. He said it might be possible ultimately to have the entire car English built.

Letts will return to England Feb. 7 after a trip to the middle west and Canada.

ATLANTA DRAWS SHOW SPACE

Atlanta, Ga., Jan. 27—Members of the Atlanta Automobile Assn., which now includes both automobile and equipment dealers under the merger of the separate organizations recently affected, drew for space allotment at the Great Southern Automobile Show to be held here Feb. 11 to 18, at a meeting held Wednesday, Jan. 18, when final plans for the show were discussed. All space for this year's event has been entirely disposed of and the show gives promise of being the largest automobile exposition that has ever been held in the southern territory. Dealers at the meeting Wednesday night expressed absolute confidence that the show will prove of material aid in bringing about a general revival of business.

Farmers to Come Back into Truck Market This Autumn

Delegates to Agricultural Conference of One Opinion With Respect to Motor Vehicle

WASHINGTON, Jan. 27—Big farmers of the United States are thoroughly sold on the value of motor trucks. No campaign of education is needed to convince them that motor equipment makes their operations more profitable. They want better servicing facilities than they are getting, but they want trucks just the same, and they are going to have them.

From the viewpoint of the automotive industry, that big message was gleaned from the National Agricultural Conference, which has brought together here the greatest gathering of men representative of every branch of agriculture ever held in this country. Representatives of big organizations of farmers in every section of the country told the correspondent of MOTOR AGE with an emphasis which left no room for doubt that truck markets in agricultural sections have scarcely been scratched.

Most important of all is the negeral conviction that the farmer will begin to come back into the market for trucks in August or September and in some sections even earlier. When they do begin to buy again, and that time is coming soon, their thoughts will first turn to motor trucks.

Users Best Advertisers

They have seen the value to their neighbors of the trucks they operate, and these successful truck users have been the best advertisements motor trucks ever had. There is not any quibbling about it. The farmers want trucks and they are going to have them just as soon as they can get the money to buy them.

Probably the biggest incentive to truck sales that ever has come out of the farming sections is the insistent and steadily growing determination to establish co-operative marketing systems throughout the country. This movement will provide an outlet for thousands of trucks.

Farmers are thoroughly incensed over high freight rates. They have learned that they can get their products to comparatively distant markets swiftly and economically by the use of trucks. Many of them are doing it now and many more of them are determined to do it just as soon as they can. The larger operators will do it alone and smaller ones will co-operate.

The co-operative movement has started on a small scale, but all great farm organizations now are backing the movement and have made it one of the cardinal points in their platform. The time is near when by far the greater part of the farm products of the country will be handled in this way. The railroads will be used only for long haul business.

One of the amazing features of the conference, in spite of all the gloom and pessimism spilled on "Blue Monday," when it started, is the fact that most of the delegates admit privately that conditions are not as bad as they have been pictured. The farmer has big problems to solve, but, speaking generally, he is not broke. Times are very hard in grain growing states and in the cotton belt and many farmers there are bankrupt. But in the remainder of the country many of them are making a little money and comparatively few are broke. This provides a huge potential market for trucks. This market will steadily expand as agricultural conditions improve.

A lot of trucks will be sold this year and dealers who study their farm products and get out of their systems the notion that the farmer simply can not buy are the ones who will profit most. There is some market for trucks even now and as the year advances the demand will increase.

Views of Many

In an effort to get the views of delegates, the correspondent of MOTOR AGE interviewed a score of them. The persons interviewed were not hand picked. They were taken at random in lobbies of the Willard or in the ante room of the convention hall. There was not attempt to select "outstanding" figures, among the delegates. Representative opinions were sought concerning the views of farmers in general on the subject of motor trucks and when they would be in the market again. Here are some of the views expressed:

Hubert F. Baker, Michigan Potato Growers Exchange, said, "Within five years 75 per cent of the farmers in northern Michigan will be using motor trucks. I believe there is a wonderful future for motor trucks on farms."

O. G. Smith, president, National Farmers Congress, and president of Nebraska Good Roads Assn., said, "Hog growers in our section are using many motor trucks and many more will be placed in use as soon as funds are available to buy them. We are thoroughly sold on the motor truck and it must be used if co-operative marketing is to be successful."

Henry C. Stuart, formerly governor of Virginia, stated his opinion as being that "the farmers of Virginia are sold on the motor truck. High railroad rates make co-operative marketing necessary and motor trucks are essential to co-operative operations by farmers."

C. V. Topping, Southwestern Millers League believes "that farmers in the territory covered by our league, which includes Kansas, Nebraska, Colorado, Texas, Oklahoma and Missouri, will be back in the market for trucks in the fall."

W. B. Hunter, president Georgia Fruit Growers Exchange, said, "I believe the demand for motor trucks has not really started and, although they already are widely used in Georgia, they are not operated to anything like the extent they will be when funds are a little more plentiful."

C. A. Cobb, editor Southern Ruralist, Atlanta, Ga., believes that "the south is about a year ahead of the rest of the country on the way back to prosperity. We were practically broke a year ago, but we have already begun to go up grade. I believe there is a great future for motor vehicles in the south."

G. M. Putnam, president New Hampshire Farm Bureau Federation, said, "When a farmer has to go six or eight miles or more to his market I believe a half ton motor truck is essential to the profitable operation of his farm."

"Economy and Efficiency Will Make 1922 Better Business Year Than 1921"

NEW YORK, Jan. 27—Following is the opinion of Herbert P. Howell, vice-president of the National Bank of Commerce, on the outlook for 1922:

"Business was in far better shape at the end of 1921 than at the beginning. It will be in better shape at the end of 1922 than it is now. In net results 1922 will be a better year than 1921. We might qualify this statement by saying 1922 will be *better, provided business men as a whole continue to act sensibly. We might say* that developments will be favorable if economy, conservatism and efficiency rule in business, rather than efforts at stimulation and expansion.

"Profits can be made and success can be established during 1922. But they must be built up by means of economy and efficiency within the bounds of conservative business operations. A lower turnover is inevitable. There is a rigid price resistance from the ultimate consumer that must be accepted. Therefore, profit margins in business must be effected by economies in production costs.

"There has developed at the end of the year just closed a remarkably general consensus among those qualified to pass judgment on business conditions that the worst is over and better lies ahead. In this judgment I heartily concur. The year 1922 may not be one of great realizations and fulfillments, but it will be one of laying the strong foundations for better business years to come."

NEW TRADE ASSOCIATION

Seattle, Jan. 29—Kittitas County has joined the Washington Automotive Trade Assn., a statewide body with branch county units. Vancouver, B. C., automobile men are taking the initiative in forming a British Columbia Automotive Trade Assn.

IN THE RETAIL FIELD

Lord & Wentz, Haynes, Nash and Stephens dealers, Springfield, Ill., have consolidated with A. Barker, Lincoln dealer. The name of the new firm is Lord, Wentz & Barker.

Nash-Albany Corp., Albany, N. Y., recently incorporated by C. H. Chambers, is the newest addition to the Nash dealers in the east.

Pacific-Nash Co., at Ogden, Utah, will hereafter be under the management of C. E. Cookley of Salt Lake City.

Mason Tire & Rubber Co., Portland, Ore., will soon be located in new quarters.

Bonestell Motor Co., Salem, Ore., will build a two-story garage soon.

Warren & Richards, Sacramento, Cal., will hereafter be known as agents for the India Tire & Rubber Co. in their territory.

Northern Motor and Machine Co., Tonasket, Wash., has been incorporated by M. E. Bowen and Chas. N. Merrill, capital $25,000.

Central Motor Co., Baker, Ore., has been incorporated by W. C. Perkins, R. C. Frisbie and A. M. Frisbie, capital $20,000. Will conduct general motor vehicle sales, machinery and repair business.

Eastern Oregon Fageol Co., Wasco, Ore., has been incorporated by W. S. Quigley, Robert Quigley, E. A. Shephard, capital $5,000. Will deal in automobiles, trucks, accessories and supplies.

Lawson Auto Company, Portland, Ore., has been incorporated by Russell H. Lawson, C. E. Jones and J. S. Cook, capital $50,000, will deal in automobiles, accessories and supplies.

Greenfield Motor Service & Supply Co. has been incorporated in Greenfield, Mass., with a capital stock of $30,000. Archer I. Potter is president and treasurer, and with him are associated William A. Davenport and Charles Fairhurst.

Oldsmobile Distributing Co., Memphis, Tenn., have just established a rebuilt and used car department at 249 Monroe Ave., under management of Ned Evans.

Greenfield Battery Co., Inc., has been formed in Greenfield, Mass., to deal in electric batteries and motor accessories. George E. Parsons heads the company.

The Dressler-White Co., Nashville, Tenn., has opened recently, as a new addition to the authorized Ford houses and has been formed by O. W. Dressler and J. C. White.

Housenick Motor Co., Bloomsburg, Pa., plans to erect an addition 67 by 130 feet to its salesrooms and garage. Brick and steel structure will be carried out.

George L. Derrickson has been appointed manager of the used car department for Henry A. Rewan, Jr., Co., distributor of Haynes cars, Philadelphia.

Hatch Motors Co., distributor of Marmon cars, Philadelphia, has removed its service station to new quarters where three times the floor space is afforded.

Maline-Harrison Motor Co., Dothan, Ala., has filed articles of incorporation with the secretary of state and will engage in the business of dealing in automobiles. J. H. Maline and others are the incorporators.

C. R. Hibbard Garage, at Rapatee, Ill., was completely destroyed by fire on Jan. 10. A big loss was entailed.

Rickenbacker Co., according to W. J. Drumpelman, sales manager, is placing franchises as fast as salesmen complete dealer investigations. Among the ones recently placed is H. A. Dougherty of Kansas City.

Dorris Chicago Co. has changed its name to Middle States Motor Corp.

Seiberling Rubber Co. of Akron, has established a factory branch at the Northwest terminal, which is headquarters for several tire companies, in charge of H. I. Post.

Mason Tire and Rubber Co. also has opened headquarters in the same building, its 25th distributing branch, in charge of W. F. Stanley. F. W. McGreery is manager of the pneumatic division.

Holgate-Bolton Co. has been appointed agent for the Chevrolet car, succeeding the Knudson Auto Co.

Madsen-Peterson Motor Co., Minneapolis, has taken over distribution of the Lincoln car. Victor Stromquist, formerly selling Packards and also the Lincoln, is general manager for the company from the first of the year.

Reilly-Herz Automobile Co., Minneapolis, has assumed northwestern distribution of the Maxwell and Chalmers cars, and will continue distribution of the Elgin car, which it has had for several years.

Minneapolis Garage Owners Association has elected officers as follows: President, W. J. Potts; vice president, G. W. Harper; secretary, W. J. Johnston; treasurer, H. S. Christian; directors, W. R. Vashro, J. L. Mowry, E. A. Zolle, H. B. Miller, H. I. Utley, L. A. Wilcox.

Joseph Toth Garage, Peoria, Ill., has been completed and occupation will begin soon.

White Co. Cleveland, has established a factory branch in New Haven, Conn., for the selling and servicing of White Motor trucks.

The Mesher Motor Sales Co., Cleveland, O., has been awarded the contract for distributing the Durant cars in Northeastern Ohio. Officers of the company are: R. N. Mosher, president and treasurer; F. H. Greesbeck, vice-president, and William B. Woods, former director of law of Cleveland, secretary.

Braley, Graham & Childs is the new addition to Dodge dealers in northwest with headquarters at Portland, Ore.

James H. Pritchard Motor Co., Atlanta, one of the Ford agencies in the southeastern territory, has been sold to L. O. Fortson, of Washington, Ga., who has organized the Fortson Motor Co. and taken over the Pritchard business.

Cook and Gill, Portland, Ore., Paige dealers, will erect a new structure soon. They will continue to use a small portion of their present building until the new building is ready.

R. C. Jasper, Moline, Ill., has organized the R. C. Jasper Motor Co. to handle the Gardner automobile and has established his agency.

Equipment Service Co., St. Louis, distributors and service station for Gabrael Snubbers, Rayfield and Schebler carburetors and J-W speedometers have moved to new quarters.

Strauss Motors Inc., St. Louis, recently organized by Milton B. Strauss, who is president, and his brother, Laurence Strauss, who is secretary and treasurer, has been appointed distributor for the Kissel cars in St. Louis and adjoining territory.

Covey Motor Car Co., Portland, Ore., Cadillac, Maxwell and Chalmers dealers, last week secured the agency for the Oakland in this territory. The car was formerly handled by the Automobile Sales company.

Hardwick-Buick Co., Chattanooga, Tenn., one of the largest and best known automobile distributing agencies in the south, operated for the past five years as a partnership, has been incorporated with $200,000 capital.

Euclid Motor Co., Cleveland, has been appointed distributor for the Cleveland car.

Avenue Motor Co. has had a change in its personell with the appointment of W. J. Buckwalter as manager of sales. Buckwalter was formerly with the Paige-Ohio Co.

Prange Motor Co., Fort Wayne, Ind., has secured the agency for this territory for the Packard cars.

Lonney & Carmichael, of Detroit, have been assigned all territory west of Buffalo for the Batavia Auto Products Co., manufacturers of the Batavia generator. This is a device for vaporizing low grade fuel.

CADILLAC SCHOOL REOPENS

Detroit, Jan .27—Cadillac Motor Car Co. reopened its technical and repair school at the factory this week for the benefit of service managers and mechanics doing Cadillac work. The school continues under the direction of Charles Rogers, who has been connected with Cadillac for 17 years and has directed the repair school for the past four.

The instructions will be given in two weeks' courses, during which the adjustments on the Cadillac type 61 and earlier models will be completely reviewed. An examination will be held at the end of the course and distributors and dealers will be notified of the examination and attendance rating of the men they have sent to the school.

Kern Is Not a Fugitive In American Bosch Corp. Case

Company Officials Declare Rumors Fomented by Former Owners for Advertising

SPRINGFIELD, Mass., Jan. 29—Arthur P. Murray, president of the American Bosch Magneto Corp., asserted today that there was no basis for a sensational report that the departure for Europe of Martin E. Kern was the result of the investigation by the Department of Justice into the sale of the Bosch plant to the present owners by the Alien Property Custodian in 1918. Murray declared that Kern sailed with the full knowledge of the Department of Justice and that he was, as a matter of fact, on a mission for the Department of Commerce, carrying letters of introduction to many embassies and consulates.

The Federal inquiry into the sale of the old Bosch Magneto Co. by A. Mitchell Palmer was characterized by Murray as a "political move." He declined to amplify that assertion beyond stating that the company's books containing the record of the sale had been placed in the hands of United States District Attorney Harris at Boston.

It has been learned in Washington that the inquiry by Harris was instituted upon instructions from Attorney General Daugherty and is in connection with the charges filed last summer by representatives of Robert Bosch, the original German owner.

Attorneys for the former German owners of the plant alleged that, whereas the property was sold by Palmer for $4,150,000, it was really worth more than $7,000,000, and that the company's patents, copyrights, trade marks and good will had been valued at only $1. They have charged that measures taken by the Alien Property Custodian were such as would not tend to bring about a favorable sale of the property; that the sale was not well advertised, that it was held in a remote place, and that an excessive deposit was required of bidders; that the information furnished about the property by Palmer did not do justice to the owners. Most of these allegations were met with denials from Palmer.

The attorneys for the former owners charged specifically that the property thus sold went into the hands of Martin Kern, treasurer of the Bethlehem Motors Corp., a lifelong friend of the Alien Property Custodian, with whom he had been interested in various transactions, and that other of Palmer's friends were associated with Kern in acquiring the property.

John A. McMartin, secretary of the American Bosch Magneto Corp., has declined to make any statement in relation to the Federal inquiry. George A. MacDonald, treasurer, has intimated that the trouble was being fomented by the former owners for advertising purposes.

BUSINESS NOTES

Schoen Bros. are incorporating for $24,000 and will open offices in Chicago, from which point they will take care of the surrounding territory. Dealers throughout the south have been signed to distribute the products of this company which consist of various automotive parts.

J. G. Brill Co., Philadelphia, has decided to go into the production of motor bus bodies on a large scale for 1922.

O. H. Christie, Buffalo, N. Y., will shortly go into production on a new type of tire chains to be known as Off'n'on chains.

Johnson Rim & Parts Co., Buffalo, has filed an involuntary petition of bankruptcy.

Pabst Corp., Milwaukee, has undertaken the production of a valve rotating device for poppet valve engines.

American Motors Corp., Newark, N. J., has sold its physical assets by court order.

Drednaut Jacks, manufactured by Auto Specialties Co., St. Joseph, are standard equipment on Durant and Dodge cars instead of on Studebaker and Grant cars as reported, erroneously some weeks ago.

Acme Mfg. & Sales Corp., Milwaukee, has been organized by A. W. Haines and others for $10,000.

Jacques Mfg. Co., makers of automobile bodies, Philadelphia, has recently moved into a large new concrete daylight building, where they will have more floor space to take care of their 1922 business.

Rubber Process Corp., Detroit, has opened offices for the development of sales in the automotive field, particularly the tire service end, of their product which is designed to increase the life of rubber. Tire treating stations will be opened throughout the country.

Wichita Motors Co., Wichita Falls, has cancelled its plan of consolidation with the Price-Campbell Cotton Picker Corp. and announces that it will continue the manufacture of Wichita trucks under the name of the Wichita Motors Co. No reorganization of the company is now contemplated.

Rotary Tire & Rubber Co. of Zanesville and the **Studebaker-Wulff Rubber Co.**, have bought the property of the Marion Tire & Rubber Co., Marion, Ohio.

United Iron Works and Machine Co., Toronto, are manufacturing a new type of gasoline engine, for cars, trucks and tractors of the four cylinder, four-cycle type, with double pistons in each cylinder. The principal advantage claimed for this engine is economy in fuel, which is effected by the greater range of temperatures consequent on a higher ratio of expansion.

Alemite Products Co., Ltd., Belleville, Ont., will shortly begin the manufacture of Alemite products for the Canadian trade. The Alemite Company is a subsidiary of the Bassick Manufacturing Co. which pioneered the Alemite system of lubrication.

Oshkosh Truck Sales and Finance Corp. has been incorporated under the state laws of Wisconsin, for the purpose of selling and financing the sale of Oshkosh 4-wheel drive trucks at Oshkosh.

Hayes Wheel Co., New York, with branches in Chicago and San Francisco, has been completed to take care of the demand for the demountable rim type of wire wheel, manufactured at Jackson, Mich.

Goodyear Tire & Rubber Co., which has a large establishment at Columbia, S. C., will continue to sell tires in South Carolina during the coming year, as has been the custom.

Roland Meacham, Cleveland broker, has underwritten the stock issue of the new $10,000,000 Seiberling Rubber Co., recently formed by F. A. Seiberling. The syndicate expects shortly to offer $1,500,000 of the Seiberling rubber stock, on a basis of four shares of 8 per cent preferred with 60 shares of no par common stock, for $1,000.

Anderson Electric & Equipment Co. of Chicago, manufacturers of Auto Reelite and other electrical and automotive specialties, has been purchased by the Appleton Electric Co.

Meaker Spark Plug Co., Detroit, has been organized in this city to market the Meaker spark plug, a two part plug which permits ready removal of carbon, with H. L. Pierson as president and treasurer, and R. H. Meaker as vice president and secretary.

Kemp Metal Wheel Co., Toronto, are placing on the market a new wheel which is a departure in auto wheel construction. The superior strength of a tube compared with any other section of the same weight and material is well known, and this abundant strength is made use of in the Kemp wheel. The spokes are firmly held by compression without threading or riveting, and most of the parts are produced by stamping from steel.

Otto R. Heiligman, Philadelphia, receiver for the Winfield Barnes Company automobile factory, has sold the plant at the southwest corner of Twentieth street and Erie avenue to B. Foster for $86,000.

Milwaukee Radiator Co. has been granted a charter with capital stock of $50,000 to manufacture radiators for motor vehicles.

Pan-American Motors Corp., Decatur, Ill., has had a receiver appointed for it. The company has dissolved.

B. F. Wulff, president of the Studebaker-Wulff Tire Co., which orginally planned to open a factory at Lincoln, Ill., but which went to Zanesville, Ohio, instead, agreed to refund all the money invested in the company by residents of Lincoln. He gave a note for the entire amount bearing interest at six per cent, and promised to forward a substantial sum each quarter until all stock purchased was redeemed. The Lincoln stockholders could not be persuaded to retain their stock but demanded their money and threatened a lawsuit for failure to respond.

Association of Automotive Equipment Manufacturers, with headquarters at 3222 W. Washington Blvd., Chicago, Ill., has just held its annual election of officers, and re-elected Nathaniel Leverone as president for another year, and also re-elected W. E. Green as secretary.

Ohio Nut & Bolt Company, which will locate a plant at Louisville within the next sixty days, will move its office force to Louisville from Berea, Ohio, where the company has operated for the past sixteen years, but its factory forces will be recruited locally. The concern has an annual payroll of $100,000, and employs about seventy-five men.

Lieut. Gov. William J. Coyle and **A. E. Woodruff** have purchased the L. M. Cline Motor Company's Ford sales and service agency at Seattle, and will commence operations on Feb. 1st.

Minnesota Dump Truck Owners' Assn. has been organized. It will co-operate with the Minnesota Highway Commission and the various road building contractors in the state. Headquarters are at Minneapolis.

Minneapolis Steel and Machinery Co. has reopened its foundry and in a month will open its machine shop. Castings made in the foundry will be ready for the machine work in less than one month. President George M. Gillette said the last 30 days has been the best the company ever has had in the truck business.

Frank G. Payson announces that effective February 1st, the general sales office of the Logansport Machine Company, Logansport, Indiana, will be moved from Chicago to the factory at Logansport, Indiana. Payson will be located at Logansport, Indiana, as Manager of Sales for the Logansport Machine Company.

Allen Motor Co. assets sale to Frank Shaw, Chicago, has been approved by Federal Judge Sater.

Southern Motor Co., St. Louis, has had an involuntary petition of bankruptcy filed against it by three creditors.

Reynold Spring Co., Jackson, Mich., in its general balance sheet as of Dec. 31, shows current assets of $572,658 and current liabilities of only $1,705. Cash amounts to $392,190; accounts receivable to $37,675 and inventories to $142,791.

Southern Tire & Rubber Co., operating a tire plant at Augusta, Ga., has opened a branch at Atlanta, under the name of the Southern Tire Sales Co. Curtis E. Smith, vice-president of the company, has charge of the Atlanta branch.

Michigan State Auto School has just completed the construction of a large steel building on their tractor farm in Redford Township.

Braley, Graham & Child, Inc., have formed a company and opened spacious quarters at Portland, Ore., from which they will distribute Dodge cars.

Central Motors Co., Baker, Ore., has been incorporated by W. C. Perkins and R. C. Frisbie.

T. B. Perkins was elected president of the Baker County Ore. automotive association at its annual meeting. Others elected were: A. F. Kerr, vice-president; directors, Ed. C. Rea, L. E. Caul and A. L. Denny. Arrangements are being made for the annual automobile show to be held early in April.

Minneapolis Automobile Trade Assn. has elected two new directors, D. A. Odell and B. E. Simpson.

Cummings-Carson Co., Portland, Ore., have taken the distribution of the Mason tire here. Catlin Wolfard has been named manager of the new concern.

Seiberling Rubber Co., of Akron, O., has opened a new southern branch in Atlanta, and will occupy a building that is now being constructed for the company. Harry I. Walters will manage the new Seiberling branch.

The Covey Motor Car Co., Portland, Ore., pioneer automobile dealers, have added another car to their line, having secured the Oakland, which will be distributed in Multnomah county.

Prosperity Isn't Coming, But is Here, Says Sherman

Buffalo, Jan. 27—Prosperity isn't coming to the automobile industry, it is here, Ray W. Sherman, merchandise director of the Automotive Equipment Assn. of America, told Kiwanis club members at a recent meeting.

"The year 1922 will be one of the keenest competition and greatest progress in the history of the automobile business," said Sherman.

"Conservative estimates place the number of automobiles which will be produced and sold this year at 1,500,000. At no time has production in this country exceeded 2,000,000 cars. With this production and with an estimated expenditure of $250,000,000 for equipment of cars already in use there is no reason why 1922 should not be a prosperous year for the automobile industry."

Sherman said fears that the "saturation point" has been reached in the automobile industry are groundless.

"That point may be reached some day," he said ,"but it is not a problem about which we need to worry now. The average life of a car is only six years. If no new sales outlets are developed the replacement demand alone will insure the automobile being a great industry as long as there is need for transportation."

CLEVELAND TRADE TRUSTEES

Cleveland, Jan. 27—At the annual meeting and election of the Cleveland Automotive Trade Assn. the following trustees were elected: E. D. Sutton, manager the I. J. Cooper Rubber Co.; Elton R. Seager, treasurer the Pennsylvania Rubber Co.; E. T. Moorby, the Polson Rubber Co.; George K. Wadsworth, manager the Ohio-General Motors Co.; M. F. Persons, branch manager the Mack International Truck Corp.; W. A. Maynard, the Packard-Cleveland Motor Co.; Ira Saks, the Pennsylvania Piston Ring Co.; J. L. Houston, the Jeavons Co., and R. F. Horstman, the Prospect Auto Top and Paint Co.

I. H. C. BEGINS TRACTOR PLANT

Fort Wayne, Ind., Jan. 28—Work has been started on the $300,000 sewer which is to be the first unit of construction work at the truck plant of the International Harvester Company east of the city. It is expected that the work of putting up the buildings for this plant will be started early this spring.

New Order of Things Awaits Lincoln After Feb. 4 Sale

Price Revision, Broader Distribution, Increased Production Promised When Ford Gets Control

DETROIT, Jan. 24—Purchase of the Lincoln Motor Co. at the receiver's sale Feb. 4 by interests friendly to Leland control will mean the carrying through of the Leland policy for the first time, according to Wilfred C. Leland, vice president and general manager of the company. Under the former regime, he said, clashing elements in the directorate made it imposible to carry these policies through to successful realization. There will be many changes in the general conduct of the company, he said, but these will be mainly in the merchandising and not the production end of the business. Former Lincoln standards of manufacture will be adhered to absolutely with the steady improvement of the product ever in mind. Better markets will be opened to the company under the reorganization, he said, and Lincoln buyers will be given the full benefit of these.

Prices will undergo revision following the sale, he declared. In the time that the factory has been in the receiver's hands a careful study of the possibilities of the plant has been made and several changes in manufacturing methods will be instituted. The equipment has been brought to the highest point of efficiency and everything is set for immediate resumption of production. It is expected that 6000 to 8000 cars will be made in 1922.

The Lincoln sales organization will be continued exactly as it stands and it will be enabled to make many new contracts in important communities under the new control. These, with the new prices and the improved quality of the product are counted upon to bring the sales to a point where the capacity of the factory may be realized upon. In a good business year it is expected to make and sell 12,000 cars.

The factory organization will be strengthened, Leland said, but in the main will continue as formerly.

Many parts formerly bought will be made by the company under the new order. In time this will include the manufacture of its own bodies, but for the present the company will continue to buy its bodies.

NEW LAWS A-PLENTY

Albany, Jan. 27—Designed to curb the traffic in stolen automobiles, and to render more easy the recovery of machines which already have been stolen, a bill has been introduced in the 1922 legislature which would make it a misdemeanor to "remove or deface" an identification mark on any automobile or accessory for the purpose of destroying its identity.

This bill is but one of a dozen measures of vital interest to the automobile world which have made their appearance before the legislature. Among the most important of the others is one which would require owners of taxicabs and motor trucks, to exhibit to the state tax commission an indemnity policy of not less than $1000 for property damage and $5000 for personal injuries before obtaining licenses.

Another bill requires trucks and trailers more than 6½ ft. wide and of one or more tons capacity to carry a green light on highways outside of cities from one-half hour after sunset to one hour before sunrise.

Dixie Flyer is Included in Rumored Automobile Merger

Louisville, Ky., Jan. 27—Plans for the reorganization of the Kentucky Wagon Mfg. Co. and a merger with eastern and Chicago automotive interests were accepted by stockholders of the company at a meeting held in the directors' room of the Fidelity & Columbia Trust Co. Jan. 20, according to an announcement made this morning by John W. Barr, Jr.

Details of the new company that will be formed and those of the merger were not disclosed by Barr, who made the following statement:

"The concern which will be formed will be one of the largest of its kind in this part of the country. Representatives of the large financial interests from Chicago and from the east, which will be partners in the merger, provided it is effected, were at the meeting yesterday.

"It is possible that the merger will be accomplished, and if it is it will enable the Kentucky Wagon Mfg. Co. to operate on a larger scale than ever before."

The plan adopted by the stockholders supersedes all former reorganization and merger plans. Details of capitalization and the identity of the interests involved, Barr would not reveal.

BRIGHT PROSPECTS IN SOUTH

Jacksonville, Fla., Jan. 27—Ford dealers from the southern part of Georgia and from Alabama and Florida, attending the annual sales conference here at the Jacksonville branch of the Ford Motor Co., agreed that the outlook for 1922 portends a prosperous year for the automobile industry in this territory.

Accessory Sales for 1921 Amounted to $238,062,591

Past Due Accounts in Industry and Outstanding Notes Showed Notable Decline

NEW YORK, Jan. 27—Purchasers of supplies from members of the Motor and Accessory Mfgrs. Assn. by automotive manufacturers in 1921 aggregated $238,062,591. The total of past due accounts held by members of the M. A. M. A. declined from $8,099,727 in January to $4,220,450 in December. The total of notes outstanding fell from $4,359,871 in January to $3,384,250 at the end of December.

December showed a sharp falling off in sales, as compared with November, although the decline was not as great as it had been expected. Sales in November were $18,998,490 and in December $14,349,750, a falling off of 24.47 per cent. Business in October aggregated $22,053,327. It was significant of the improved conditions in the automotive industry that December business was very much better than sales in January and February. In fact, it did not fall far short of equalling that done in the first two months of the year together. The statistics by months for the entire year will be found in the accompanying table:

BILL REGULATES TRUCKS

Albany, Jan. 28—Regulation of the weight and dimensions of motor trucks with penalties for violations is provided in a bill introduced in the state legislature by Senator Lowman. The measure provides that except with a written permission from the state tax commission no person shall have the right to operate on a public highway or bridge a truck with a width of body inclusive of load in excess of 8 ft. or with a height from pavement to the top of the vehicle or load of more than 12 ft. 6 in. When the truck has a trailer the combined weight of truck and load or the trailer and load must not be in excess of 28,000 lbs. where the vehicle has four wheels. The axles of trucks must not be closer together than 8 ft. and the weight of four wheel trucks must be so distributed that no more than 5000 lbs. rests on each wheel nor must there be more than 800 lbs of pressure per inch width on the tire of any wheel.

Year's Accessory Business by Months

Month	Total Purchases	Per Cent Change	Total Past Due	Per Cent Change	Total Notes Outstanding	Per Cent Change
January	$ 6,264,587		$ 8,099,727		$ 4,359,871	
February	10,408,962	66.15 Inc.	6,717,165	17.07 Dec.	6,063,118	39.08 Inc.
March	20,120,386	93.30 Inc.	5,603,992	16.57 Dec.	5,069,877	16.38 Dec.
April	26,746,580	32.93 Inc.	5,352,271	4.49 Dec.	5,371,086	5.94 Inc.
May	26,781,350	.13 Inc.	4,505,176	15.64 Dec.	4,460,355	16.77 Dec.
June	22,703,414	15.19 Dec.	4,720,973	4.79 Inc.	4,012,670	10.37 Dec.
July	23,096,214	1.68 Inc.	5,242,046	10.79 Inc.	3,690,154	7.90 Dec.
August	23,397,640	1.31 Inc.	4,348,790	17.06 Dec.	3,494,510	5.30 Dec.
September	23,141,891	1.09 Inc.	4,358,545	00.22 Inc.	3,677,500	5.24 Inc.
October	22,053,327	4.70 Dec.	4,512,680	3.54 Inc.	3,463,500	5.82 Dec.
November	18,998,490	13.85 Dec.	4,352,000	3.56 Dec.	3,661,900	5.73 Inc.
December	14,349,750	24.47 Dec.	4,220,450	3.02 Dec.	3,384,250	7.58 Dec.

The Readers' Clearing House

Questions & Answers on Dealers' Problems

Should Have Filed Claim Within 90 Days

Q—I am writing you in regard to some work I did on the local light plant. Some time ago the light plant here changed hands and the party that has the controlling interest in it engaged me to set up and repair one of the engines. It has been about four months since I finished setting up the engine and I have not been able to get my money. The concern is a corporation composed of stockholders. They say they intend to pay all their bills, but as the plant is not run on a paying basis, I don't think it will ever pay me.

There is a carpenter and a lumber dealer here that have a lien on the building, one for labor and the other for supplies, and a hardware dealer has a bill but I don't know if he has a lien or not. Could we all get together and sue the company or could I serve an injunction on them and shut it down? Please let me know what to do to get my money.—W. C. S., Hitchock, S. D.

Like many another without a working knowledge of law in your own field of business, you have delayed too long in your claim to insure the collection of same by lien. When you performed the services described you had a lien for your charges on the plant, under section 1643 of the South Dakota Code of 1919. But in order to preserve this lien, Section 1649 required the filing of a statement of claim with the clerk of the courts of the county where the property is situated within 90 days from completion of the work, etc. This lien is given priority to most claims, and had you acted in time yours should have been paid in full.

It is possible you could join with other claimants against the corporation and have a receiver appointed to take charge and run the plant in order to preserve the assets and work out full payment of such claims. You have not set forth any grounds for an injunction to issue to close down the plant.

You have your remedy at law to sue and secure judgment and then collect under the judgment, and equity would not enter in on your behalf alone. Your claim prior to change of control is not affected by such change, it being the same corporation and your claim is against the corporation and not against the stockholders.

OPERATION OF TWO CYCLE ENGINE WITH OPEN BASE

Q—Is it pernicious to use one-half ether and one-half gasoline as a priming fluid to start cold engine?

2—An article in MOTOR AGE, May 19, 1921, issue, under Readers' Clearing House head, the editor states that in a two-cycle engine the combustion must be precompressed in order to get it into the working cylinder, and that this is done sometimes by an entirely separate pump. Explain this latter principle.—D. C. Slick, 2625 Lincoln Ave., Granite City, Ill.

1—One-half gasoline and one-half ether are considered a very good priming solution. The properties of ether as described in your letter are possessed by picric acid but not by ether. The regular commercial ether as put up by Squibb can be used if ordinary care is exercised.

2—The separate injection of fuel or air is practiced only on slow speed, heavy duty engines of the Diesel or semi-Diesel type. The main points of difference are the unsually high compression pressures used in this type of engine. Instead of taking in a mixture of gas and air for instantaneous explosion, its charge primarily is of air and its compression to a pressure where the temperature attained is above the igniting point of the fuel, then injecting the fuel under a still higher pressure by which spontaneous combustion takes place gradually with increasing volume. The still higher pressure is secured by use of a separate compressor driven by the engine. The pressure of compression before injection of the fuel is in the neighborhood of 500 pounds.

The Readers' Clearing House

THIS department is conducted to assist dealers and service station executives in the solution of their problems.

In addressing this department, readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been made and these are answered by reference to previous issues.

Inquiries not of general interest will be answered by personal letter only. Emergency questions will be replied to by letter or telegram.

Addresses of business firms will not be published in this department but will be supplied by letter.

Technical questions answered by B. M. Ikert and P. L. Dumas; Legal, by Wellington Gustin; Paint, by G. King Franklin; Architectural, by Tom Wilder; General Business questions by MOTOR AGE organization in conference.

INSTALLING FORDSON VALVES

Q—Will it pay to install Fordson valves in a 1917 model Ford touring car?

2—How much will they increase the power?

3—Will it improve acceleration?—F. A. Greenawalt, Lanark, Ill.

1—A noticeable increase in power will be secured by the installation of Fordson valves.

2—It is impossible to state exactly how much it will increase the power but as before stated there will be a noticeable increase.

3—The acceleration also will be improved if the engine is carbureted properly.

PRESENT DAY FUEL CAUSES KNOCK

Q—We have a 1914 Cadillac that has a knock similar to the knock that you have had inquiries about in the issue of Dec. 29, where recommend using a replacement type of hot spot. Send me names of the makers of these devices. New Danville Garage, New Danville, Pa.

This information will be supplied by special letter.

Properties of Glycerine

Q—Supply a table showing the freezing points of glycerine antifreeze mixtures with reference to specific gravity?

2—Is there a hydrometer manufactured which will give the freezing points of such solutions without requiring comparison with a table?

3—What is the boiling point of glycerine?—Irving S. Smith, 101 W. Tenth St., Pueblo, Colo.

One hundred per cent pure glycerine has a specific gravity of 1.265 and will congeal at minus 35 deg. Fahr. The following is a table showing freezing points with variation in specific gravity.

Percentage of Solution	Specific Gravity	Freezing Point, Fahr.
5	1.024	30
10	1.051	27
20	1.075	21
30	1.105	plus 1
40	1.127	minus 23

2—S. S. Jackman, 290 S. La Salle street, Chicago.

3—554 degrees, Fahr.

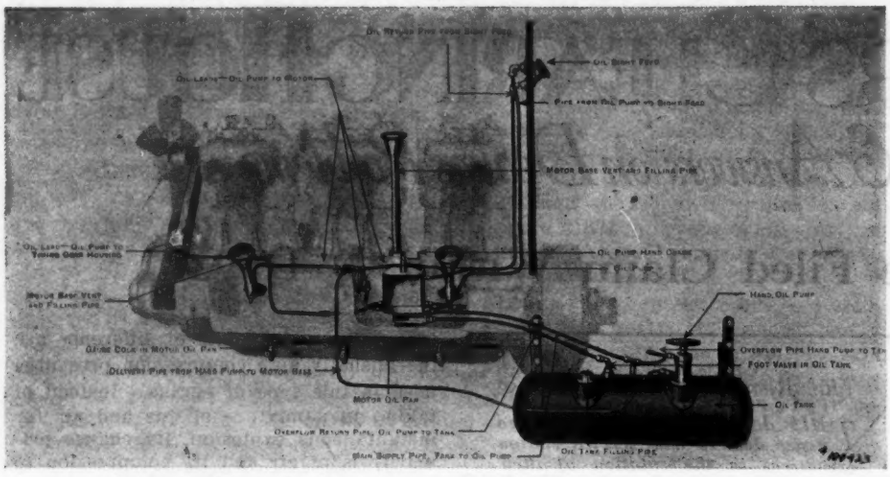


Fig. 1—Diagram showing lubrication of an old Lozier model

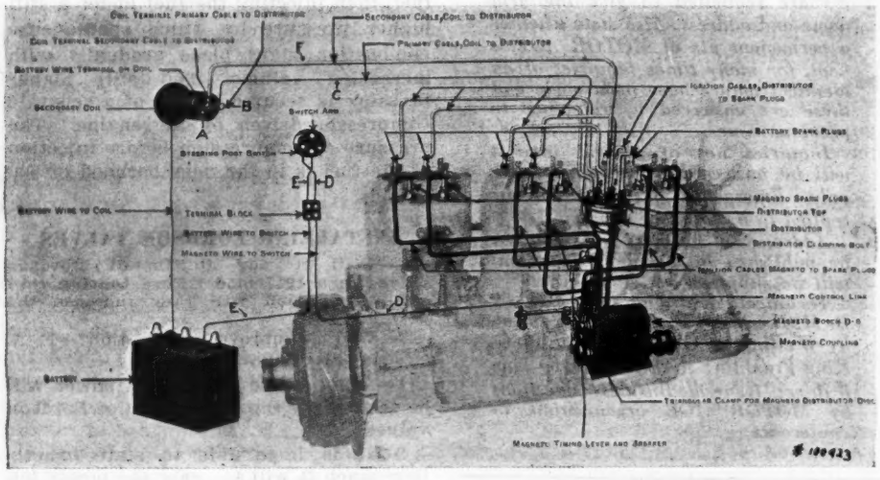


Fig. 2—Ignition system diagram of old Lozier engine

INFORMATION ON OLD STYLE LOZIER

Q—Publish complete oiling diagram of Lozier engine, series No. 3, chassis No. 3694 and engine No. 3687-A. This model has a plunger pump as well as a distributing pump. Explain the relation between the two.

2—Has the reserve tank air pressure to force the oil up to distributing pump?

3—Give firing order of this engine.

4—What make battery ignition system was used on this car? If possible, furnish drawing of distributer.

5—In what year was this car built?—The Vincennes Auto Repair Co., Chicago, Ill.

1—A diagram of the engine lubrication system is shown in Fig. 1. The height of the oil in the motor pan is determined by gage cocks on the left side of the lower half. Oil should be poured into the motor pan through the vent tubes until it just begins to flow out of the try cocks, or the required quantity can be pumped into motor pan by the hand pump on oil tank. The crank case is divided into two compartments, provision being made that the oil will find a common level.

It will require about three quarts of motor oil for the crank case. The entire oiling system will contain about four gallons. The oil pump is on the rear end of the crank case at the left side. It is a force pump of the multiple plunger type. The oil sight feed on the dash indicates whether the oil pump is working. A small intermittent stream of oil (4 to 5 drops after each interval) will flow through the sight feed so long as the pump is working properly. The auxiliary oil tank is equipped with a hand pump which is used for supplying extra oil for fast or heavy touring. The capacity of this pump is approximately one-half pint to every stroke.

2—No. The oil is forced up by the hand plunger pump.

3—1-2-3-6-5-4.

4—The diagram of the ignition system wiring is shown in Fig. 2.

5—1913.

AUXILIARY AIR VALVE ADJUSTMENT ON PACKARD CARBURETOR

Q—Tell me how to adjust the auxiliary valve on a Packard third series.

2—How to time the ignition.—H. D. Williams, Topeka, Kan.

1—Adjustment of the auxiliary air valve is made by changing the tension of the air valve springs. These springs which control the action of the valves are adjusted by means of cams placed beneath them and operated by the air valve control on the instrument board. The proper adjustment for normal running is obtained when the control on the instrument is in number 4 notch. Adjustment for atmospheric conditions and starting the engine may be made by pulling out or pushing in the control to the required number of notches.

2—The spark setting in the fully advanced position should be two and five-eighths inches measured os the circumference of the flywheel before upper dead center. Remove motor starter switch cover over flywheel. Set the spark lever on the steering wheel in the fully advanced position. Open all priming cups with the exception of the one in number one cylinder in the right block. Crank the engine by hand until compression begins in this cylinder, then open this priming cup and continue to crank the engine slowly to the point where the right circuit breaker just begins to separate.

In this position the letters SR on the flywheel should be just opposite the center line of the engine, as indicated on the crankcase. In order to test the synchronism of the left hand block, proceed as above excepting that the priming cup in number one cylinder in the left block should be closed. Under these conditions the letters SL should be just opposite the center line of the engine as above. The opening of the points which is controlled by the cam is secured by loosening the nut on the end of the distributer shaft and moving the cam to secure the proper setting, after the setting is made it should be checked over again taking especial care that the distributer cam retaining nut is tight.

PROPERTIES OF GASOLINE

Q—Advise how gasoline is tested and where we can obtain instrument for making test. Does the test of, say 62, relate to specific gravity of the gas?—Central Filling Station, Concord, N. C.

The testing of gasoline is an operation requiring much elaborate equipment, that is to secure the test usually conducted by the average petroleum companies. These laboratores conducted by various oil companies test the gasoline for end point, for heat units, carbon content, etc. The test commonly used commercially and the one with which you are most familiar is the specific gravity test. Specific gravity thermometer can be secured from any of the automobile jobbing houses, or from any of the leadisg druggist supply jobbers.

WANTS COUNTERBALANCE CRANKSHAFT FOR BUICK

Q—Advise where I can purchase a counterbalance crankshaft for Buick H-45.—Lewis & Saurs, Everly, Ia.

We know of no concern that is engaged in the manufacture of counterbalance crankshafts for Buicks exclusively. The name of firms engaged in the manufacture of counterbalance crankshafts for all cars will be supplied by special letter.

WANTS TO COUNTER-BALANCE HUDSON 33

Q—Advise where I can secure counterbalances for Hudson 33 engine.—Art DeLinde, Chicago, Ill.

We have no record of any firm manufacturing these counter-balances.

DIAGRAMS OF SIMMS AND U. S. L. SYSTEM

Q—Publish internals of Sims-Huff 5-brush motor generator as used on the 1919 Maxwell.

2—Internal circuits of U. S. L. motor generator as used on a 1917 Nelson car? —Acme Electric and Auto Works, care R. A. Parker, 1210 S. Grand Ave., Los Angeles.

1—The wiring diagram is shown in Fig. 5. The starter is Model SMS No. 3. Running freely the starter takes 5 amperes at 13 volts, at armature speed of 1110 r.p.m. The generator maximum current output is 12 amperes at 1750 to 1900 r.p.m. At 3000 r.p.m. the output is reduced to 10 amperes.

2—Wiring diagram is shown in Fig. 4. There are 8 field poles and 8 brushes. Six poles carry only series coils, one pole is wound with the shunt coil and the other pole is wound with a series coil and a coil called the compensating field winding. Starting switch is of the magnetic type mounted on the dash. Generator regulation is by reverse field and armature reaction.

Maximum current output is 10 amperes at 15 m.p.h. or 600 r.p.m. of the armature. In some cases an external resistance is connected in series with the shunt field and the output can be varied manually. Pressure of the brushes on the commutator is one and three-quarters pounds. Shunt field winding takes 1.3 amperes at 15 volts.

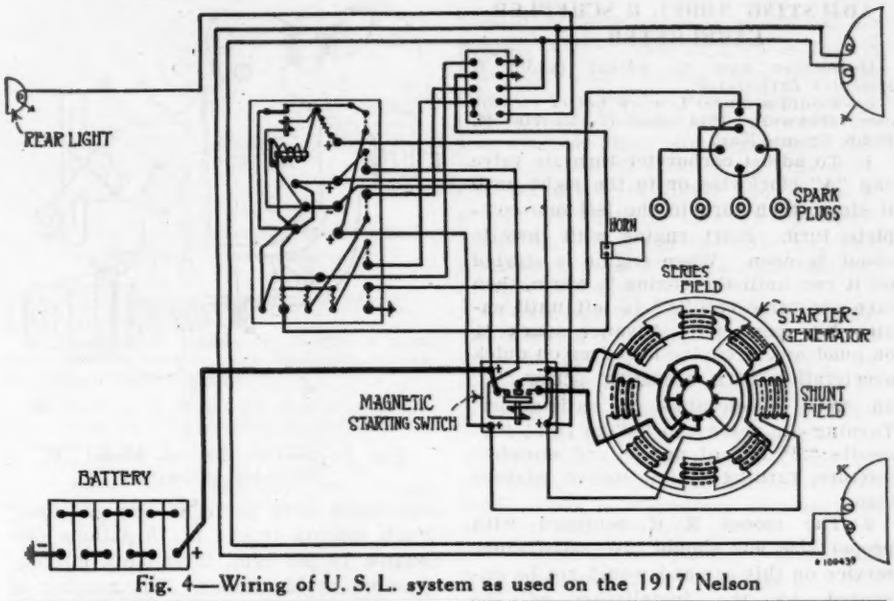


Fig. 4—Wiring of U. S. L. system as used on the 1917 Nelson

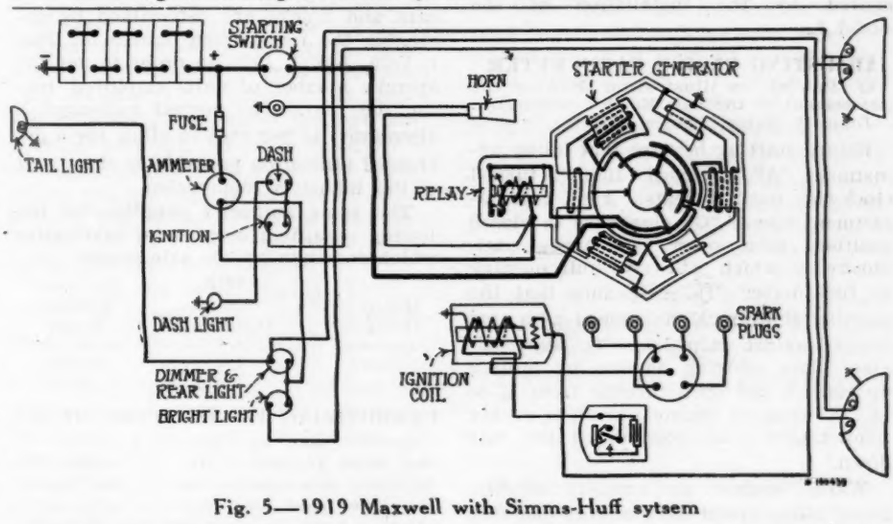


Fig. 5—1919 Maxwell with Simms-Huff sytsem

HOW TO FIND THE PISTON DISPLACEMENT

Q—Advise a good or simple formula for finding the piston displacement on a four and six cylinder car.—Joe P. Sey Fried, Indianapolis, Ind.

The piston displacement of an engine refers to the volume of the space swept by the pistons on one full stroke. This is nothing more than a mathematical form of finding the volume or cubical contents of a cylinder. In order to secure the piston displacement it is necessary to know the bore and the stroke of the engine. The formula for securing the volume of a cylinder is simply that the volume equals area of base times altitude which can be transposed into piston displacement of one cylinder equals area of diameter times stroke. Let us assume a cylinder 3 by 5 in. the area of the diameter or area of base will be $D^2 \times .7854$ where "D" is the cylinder diameter $= 3^2 = 9 \times .7854 = 7.0686 \times$ the stroke $5 = 35.340$ displacement of one cylinder in cubic inches $\times$ number of cylinders $4 \times 35.3430 = 141.3720$ cu. in. total displacement of engine.

IMPOSSIBLE TO USE SMALLER BATTERY IN 1914 RAMBLER

Q—Would like to know if a smaller battery can be used in a 1914 Rambler in place of the 24-volt battery?

2—Is there a company that makes bodies for such a make of car?—Calvin L. Thex, Otter, Mont.

1—This system will not operate on anything but the same size battery as was originally used, unless the starter is rewound, which would cost considerably more than a new battery.

2—We know of no company that builds port bodies exclusively for this make of car. A special letter will supply you with names of the leading custom body firms that will build any kind of a body to fit any kind of a chassis.

LOOSE PISTON CAUSES HUDSON ENGINE TO SLAP

Q—We have a Model 12 Hudson Super-Six which has never been overhauled and has a curious metallic knock which seems to be on all six when idling. We thought it was a piston pin, so removed the engine and gave it a general overhauling. We examined the piston pin, timing gear, camshaft bearing, distributer shaft and gears and found all in good condition. Also took up all the main end bearings and set the ignition as directed by the factory, but the knock did not leave. The only thing I can think of now is that the knocking is caused by the side slap on the connecting rod bearing, as it has quite a bit of side play. Could it be possible for the side slap to cause a knocking as stated, or is there any other cause?—Jack T. Koizumi, Waurika, Okla.

There is little doubt but what this knock is caused by a loose piston in the engine. It is a familiar noise known as the piston slap. This slap is sometimes very difficult to detect but usually makes itself known a little more prominently when the engine is pulling hard on an advanced spark. It is also easily confused with a spark knock.

Usually but not always the piston slap is more pronounced when the engine is cold. Sometimes the addition of heavy oil will cause a partial elimination of this knock. However, we would recommend that you remove all the pistons and carefully micrometer the cylinders and then micrometer the pistons, and if there is more than .006 clearance between the piston skirt and cylinder on any one cylinder it is sufficient proof that the pistons are causing the knock.

DATA ON MONROE

Q—What kind of a differential was issued in the 1920 Monroe five-passenger touring car, and what company manufactures same? This car was formerly manufactured by the William Small Co., Indianapolis, Ind.—R. L. Wilhelm, Athol, S. Dak.

The Wm. Small Company was sold at receiver sale last week. The last batch of cars were equipped with the Powrlok differential manufactured by the Powrlok Company, Cleveland, O.

ADJUSTING MODEL R SCHEBLER CARBURETER

Q—Advise how to adjust model R Schebler carburetor.

2—Would a model L work better on this car, Maxwell, 1918 model?—Morris K. Bobb, Lyons, Kan.

1—To adjust carbureter turn air valve cap "A" clockwise or to the right until it stops, then turn to the left one complete turn. Start engine with throttle about ⅛ open. When engine is started let it run until the engine is warm, then turn air valve cap "A" to left until engine hits perfectly. Advance spark ¼ on quadrant, if engine backfires on quick acceleration turn adjusting screw "F" up until acceleration is satisfactory. Turning air valve cap "A" to right lifts needle "E" out of nozzle and enriches mixture, turning to left makes mixture lean.

2—The model R if equipped with proper size jets should give satisfactory service on this car and would not be improved by the installation of the model L.

ADJUSTING ENSIGN CARBURETER

Q—Publish an illustration showing the adjustment of the new Ensign carburetor. —John H. Suter, Peoria, Ill.

Before starting be sure that idling adjustment "A" is closed; that is turned clockwise until it seats. Turn fuel adjustment sleeve "G" clockwise to closed position, then open two turns anti-clockwise which will give full opening to fuel orifice "H." Be sure that the starting shutter "E" is opened with stop finger against stop lug. To start engine, close starting shutter by pulling up control and open throttle from ¼ to ½. As soon as engine warms to proper temperature push control all the way down.

Warm engine up running slightly above idling speed until mixing chamber of carbureter is warm, then place throttle to about 1/3 motor speed position with spark fully retarded; now thin the mixture by turning "G" clockwise until best engine speed is obtained with this throttle setting. Slow down engine and adjust screw in throttle stop for idling position, then adjust idling mixture by opening adjusting screw "A" anti-clockwise to a point where the engine idles evenly and with no loading. Too thin an idle mixture will result in a flat spot or hesitation when accelerating. If engine stops when de-celerating it is an indication of air leaks in the manifold. These adjustments are shown in Fig. 6.

STATISTICS ON OIL CONSUMPTION

Q—We have had considerable discussion as to the average consumption of motor oil by the motorist and truck user. We, in our own department, have figures from 12 to 20 gallons of motor oil per year for the average motorist and from 30 to 60 gallons for the truck operator. No figures have been available as to grease consumption per unit. Supply whatever figures you have on this.—Standard Oil Co., J. W. Stack, Chicago.

The figures given herewith are taken from the economics of petroleum by Pogue. There are as follows: Eight and one-half million cars at 25 gallons

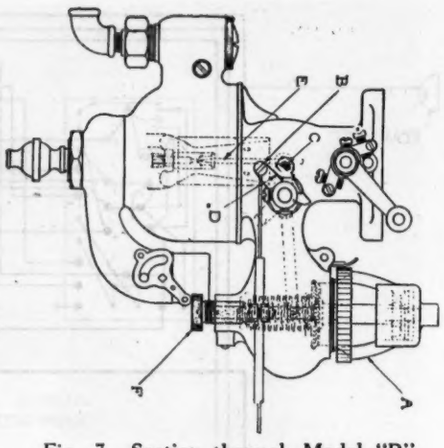


Fig. 7—Section through Model "R" Schebler carbureter

discounted is 10 per cent, one and one-tenth million trucks at 75 gallons discounted 10 per cent, three-tenth million tractors at 75 gallons. The number of cars and trucks are determined by averaging the registration figures for Jan. 1, 1920, Jan. 1, 1921, in order to get the average number of units employed during the year. The normal gallonage is discounted 10 per cent to allow for a decreased utilization probable as the result of the industrial depression.

The same authority supplies the following regarding greases for lubricating which does not include axle grease:

	1919	
Quantity thousand gallons, 12,599	Value thousands of dollars, 6044	Average price, cents per gallon, 48.0

CARBONIZING TRANSMISSION GEARS

Q—We have an Oakland 6, model 34, that went through a fire and would like to know what parts can be used again. Will the front axle, spindles, rear axle-cylinder head, transmission case, flywheel, crankshaft, camshaft and rocker arms be serviceable? If not what could be done to put them in shape for use? How should I go about it to harden the small gears such as the transmission gears?—E. W. Davis Auto Co., Morrill, Kan.

The front axle, spindles, rear axle-shafts, rear axle housing, engine block, cylinder head, transmission case and flywheel should not have been injured to any extent. Unless any of these mentioned items were red-hot they can be used without any work being done on them whatsoever. The crankshaft, camshaft and rocker arms should be thoroughly tested before any work is done on them. If the crankshaft and camshaft have been subjected to extreme heat it would be advisable to send them to the factory to be re-heat treated. The transmission gear should be case hardened but not the small gears such as the timing gears.

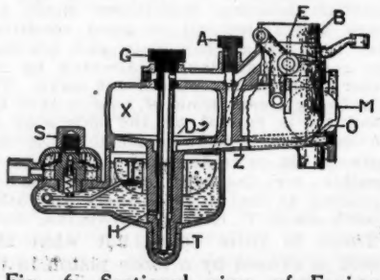


Fig. 6—Sectional view of Ensign carbureter showing points of adjustment

The transmission gears are case hardened as follows: Carburize to about 16 to 1650 Fah., cool slowly in carburizing box, re-heat and oil quench from 1550 to 1623 Fahr. Re-heat and oil quench from 1350 to 1425 Fahr. However, we would not recommend any of these procedures until you have consulted the maker of this car to determine the chemical properties of the steel of each part because the chemical properties determine the method to be used in heat treating steel. The above procedure is recommended for gear steels possessing a carbon content of .25 per cent or under.

OLD MOLINE REQUIRES NEW CARBURETER

Q—The engine is an M 35 Moline Dreadnaught touring car that I use for a service truck, gives very good service at certain speed, about ¼ throttle. Under this it loads very badly, over it seems to starve till the throttle is almost open, then it works good. It has the original Model L. Schebler carburetor connected to a very long inlet pipe, about 12 in. to the branches which run level to inlet ports on the cylinder blocks. It has a hot air tube to carry air to the low speed air elbow. Is there any way to fit a hot-spot to the inlet manifold where it starts to branch?

2—Would it be better to cut this manifold off close to the branch and weld flange and attached carburetor as near to horizontal part of manifold as possible, using a vacuum tank to furnish gasoline?

3—Would it be better to use a late model carburetor?

4—Which would you advise if new carburetor was needed, Schebler model R, Stromberg or Zenith? — Bert Jordan, Springville, Ia.

1—Yes. We will supply by special letter the name of firm manufacturing replacement type hot-spot manifold for this car.

2—Yes.

3—The late model carbureter will give much better results than the old style carbureters due to their inability to handle the present day gasoline.

4—Either of the three mentioned carbureters should work satisfactorily on this car.

READER WANTS TO INSTALL A FOURTH SPEED GEARSET

Q—Would like to gear up a Chevrolet F. B. 1921 model in a fourth speed leaving differential gears the same, direct gear the same but have a fourth speed in gear making ratio about 3 to 1 between crankshaft and wheels. Will you inform me the most economical way of securing this result?—Crescent Garage, F. Cats, Bishop, Calif.

The most economical way to secure this condition would be to install a four speed transmission. It would be impracticable to attempt to remodel the present transmission into a four speed transmission and the cost would be prohibitive. In installing a four speed transmission it necessitates considerable revision of the control mechanism of the car. In short there is really no economical way to bring about this change.

HOT-SPOTTING AN OVERLAND

Q—We have just overhauled an Overland engine, model 80. This engine has good compression and carburetor has been overhauled by Schebler Service Station. The magneto is set so that breaker points are just about to open on top center fully restarted. The magneto is NU4. The engine will not start unless magneto is fully advanced. Is there that much lag in this type of magneto, if not where can our trouble be?

2—The engine runs good idling and pulls good on the level but seems to load up on making the grade and doesn't seem to have any pep. Would you lay this to the design of the intake manifold on this car? Would a hot-spot type of manifold relieve this condition?

3—If a hot-spot manifold will relieve this condition kindly give us the address of concerns that manufacture them. Or is there any way that this can be overcome without the expense of a new manifold?

4—What is the proper valve clearance of this engine?

5—Supply address of the manufacturer of the Fansteel vibrator.—Sam's Repair Shop, Provincetown, Mass.

1—This difficulty in starting is due to the fact that a hotter spark is produced when the spark lever is advanced. It also produces a better timing position. If the magneto is in first class shape it should start the engine with the breaker about ¼ advanced. It is possible that the spark plug gaps are set too far apart, if the magneto will not deliver a spark ¼ in. long it is in need of repair. Would recommend that you remove the magneto and test it thoroughly on the bench, running it at various speeds including the cranking speed and note whether spark is steady and of sufficient intensity.

2—These symptoms are indicative of improper carburetion. The addition of a hot spot to manifold should do much to relieve this trouble.

3—The names of concerns that manufacture these hot spots will be supplied by special letter. It is not necessary to purchase an entire new manifold.

4—The proper valve tappet clearance is .012 for both intake and exhaust.

5—Fansteel Products Company, North Chicago, Ill. A wiring diagram showing the installation of the Fansteel vibrator in connection with a single high tension magneto is shown in Fig. 9. Because of the tendency to kick, the makers of this coil do not recommend that it be installed on a set spark type of magneto.

PERSISTENT OIL LEAK IN OAKLAND

Q—Have been working on an Oakland 6, 1920 model, trying to stop the oil leak around the rear main bearings and have failed to stop it. Have fit up the bearings to the crankshaft, made an oil drain from the oil hole in the bearing to the inner end of bearing, put felt both over and under crankshaft, but still it leaks. It leaks about one gallon of oil for every five gallons of gas. Now what might be the cause of this leak?

2—This car has a hollow crankshaft and therefore the bearing must be practically oil tight.

2—Is it possible to overcharge a storage battery when towing or under continued driving with the cut-out relay working properly and no thermostat in the system?

3—What is the proper way of taking the end play from a crankshaft and how

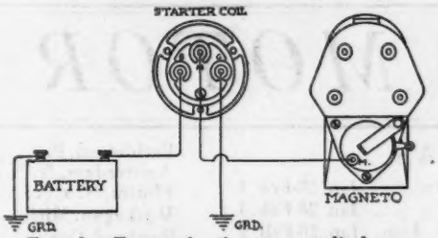


Fig. 9—Fansteel vibrator applied to single high tension magneto

may it be done in small shops or in emergency cases?

4—How much clearance should a cast iron piston have in the cylinder where both have been reground?

5—How much clearance should a piston ring have in the cylinder to the inch of bore and in the piston groove?

6—Should pistons be lapped in after both have been reground and turned down on the lathe?—Carmon A. Meyer, St. Petersburg, Fla.

1—This trouble is due to one of two causes. Either a poorly fitting upper main bearing bushing or excessive oil pressure. We would recommend that you set the pressure so that its maximum is not over 26 pounds. The only cure for this is to dismantle the engine and refit the upper half of the rear main bearing, and all the other bearings at the same time if they require it. In refitting the bearings in an engine where a force feed oiling system is used they should not be fitted as tight as where splash lubrication is utilized.

Wtih all the main bearings fitted, it should be impossible to turn the crankshaft of this engine by hand.

2—Yes.

3—The proper way to eliminate end play in a crankshaft depends entirely on the design of the shaft and bearing. In many cases the center bearing takes the end thrust while in other engines the rear bearing or the other front bearing takes the end thrust. The proper method in these cases is to replace the bearing with a new bushing so that it will take up excess clearance. In emergency cases the end of the bearing bushings can be faced off level and brass semi-circular rings pinned into each half of the bearing or screwed in. This semi-circular piece of brass should be of proper thickness to take up the clearance. This is about the only and best emergency method where new bearings are not available.

4—Cast iron piston should have a skirt clearance of approximately .001 in. per inch of cylinder bore. However, the clearance at the ring land should be much greater. The best rule is to allow .003 to .004 per inch of diameter on the top ring land, and between .002 and .003 per inch of diameter on the next to top land. This is absolutely necessary on any make of gray iron piston.

5—Piston rings should be fitted with from .001 to .002 in .clearance per inch of cylinder bore. For the moderate high speed engine of 3 to 4 in. bore the clearance of .006 in. is good all around clearance. Rings should fit the ring grooves freely but not too freely. One-quarter to .001 in. clearance is recommended.

6—This is not absolutely necessary although a very slight lapping is desirable. This only enough to remove irregularity of surface of the cylinder bore. Too much lapping will spoil the job and reduce the diameter of the piston and increase the diameter of the cylinder with a consequent increase in clearance which is not desired.

CYLINDER HEAD FOR OVERLAND 4

Q—Furnish name of manufacturer making valve-in-head cylinder head for the new Overland four.—G. T. Patterson, Topeka, Kan.

We know of no firm making the valve-in-head cylinder head for this car.

Poor Grade of Felt Won't Retain Grease

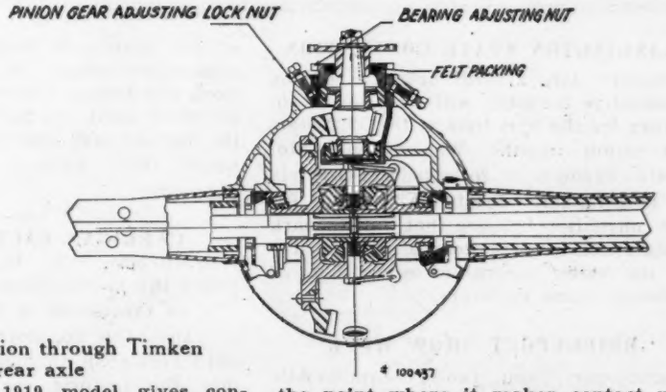


Fig. 8—Section through Timken rear axle

Q—A Liberty 1919 model gives considerable trouble with the grease leaking out of the pinion shaft bearing. We have installed three felt washers but they don't last long. This is a Timken axle and the original felt gave good service. The axle seems to be adjusted alright and the shaft is smooth where the felt goes. Can you give me any idea on how to fix it and a cut to show how the felt is fitted?—E. J. Kelleran, 86 N. Seventeenth St., San Jose, Cal.

If the pinion shaft flange is smooth at the point where it makes contact with the felt the trouble is due to the felt itself. Would suggest that you secure a new washer from the Timken Axle Co. of Detroit and this will eliminate this trouble which is due to the fact that the felt you are now using is of a poor grade for this work. A cut showing the location of this grease retainer is shown in Fig. 8.

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Chicago	National Automobile Show	Jan. 28-Feb. 4
Chicago	Automobile Salon	Jan. 28-Feb. 4
Allentown, Pa.	Lehigh Automobile Trade Assn.	Jan. 28-Feb. 4
York, Pa.	York County Dealers' Assn.	Jan. 28-Feb. 4
Hudson, N. Y.	Automobile Show	Jan. 30-Feb. 4
Sunbury, Pa.	Automobile Show	Jan. 30-Feb. 4
Erie, Pa.	Automobile Show	Jan. 30-Feb. 4
Scranton, Pa.	Annual Automobile Show	Jan. 30-Feb. 4
Olean, N. Y.	Automobile Show	Jan. 31-Feb. 4
Poughkeepsie, N.Y.	Automobile Show	February
Lancaster, Pa.	Automobile Trade Assn.	Feb. 1- 4
Pontiac	Pontiac Automobile Dealers' Assn.	Feb. 1- 4
Columbus	Columbus Automobile Dealers' Assn.	Feb. 2- 8
Tampa, Fla.	South Florida Fair Assn.	Feb. 2-14
Meriden, Conn.	First Automobile Show	Feb. 4- 8
Troy, N. Y.	Eighth Annual Used Car Show	Feb. 4-11
Youngstown	Youngstown Dealers' Assn.	Feb. 4-11
Scranton, Pa.	Annual Motor Truck Show	Feb. 6- 9
London, Ont.	Nat'l Motor Show of West Canada	Feb. 6-11
Minneapolis	Tractor Show	Feb. 6-11
Minneapolis	Automobile Show	Feb. 4-11
Winnipeg, Can.	Canadian Equipment Assn.	Feb. 6-11
Schenectady	Schenectady Dealers' Assn.	Feb. 6-11
Flint, Mich.	Mich. Automotive Trade Assn.	Feb. 8-11
Kansas City	Kansas City Motor Dealers' Assn.	Feb. 11-18
Atlanta	Southern Automobile Show	Feb. 11-18
San Francisco	6th Annual Pacific Automobile Show	Feb. 11-18
Huntington, W. Va.	Automobile Show	Feb. 13-18
Wilkes-Barre, Pa.	Dealers' Assn.	Feb. 13-18
Kalamazoo, Mich.	Mich. Automotive Trade Assn.	Feb. 14-18
Albany	Automobile Dealers' Assn.	Feb. 18-25
Hartford, Conn.	Hartford Automobile Dealers' Assn.	Feb. 18-25
Salt Lake City	Automobile Show	Feb. 20-25
Duluth, Minn.	Automobile Show	Feb. 20-25
Dallas, Tex.	Automobile Show	Feb. 20-25
Bethlehem, Pa.	Automobile and Accessory Show	Feb. 20-25
Louisville, Ky.	14th Annual Automobile Show	Feb. 20-25
Syracuse	14th Annual Automobile Show	Feb. 20-25
Gr. Rapids, Mich.	Michigan Automotive Trade Assn.	Feb. 20-25
Norfolk, Va.	Automobile Show	Feb. 20-25
Deadwood, S. D.	Deadwood Business Club	Feb. 21-25
Ottumwa, Iowa	Automobile Show	Feb. 22-25
Clinton, Ia.	Automobile Show	Feb. 22-25
Trenton, N. J.	Car, Truck & Accessory Show	Feb. 22-25
Springfield, Ill.	Automobile Show	Feb. 23-25
Montreal	Automobile Show	Feb. 25-Mar. 1
Des Moines	Winter Automobile Show	Feb. 26-Mar. 3
Bethlehem, Pa.	Truck and Tractor Show	Feb. 27-28
Amsterdam, N. Y.	Automobile Show	Feb. 27-Mar. 4
Elmira, N. Y.	Elmira Automobile Club	Feb. 27-Mar. 4
Muskegon, Mich.	Michigan Automotive Trade Assn.	Feb. 27-Mar. 4
Portland, Ore.	Portland Dealers' Assn.	Feb. 27-Mar. 4
Springfield, Mass.	7th Annual Automobile Show	Feb. 27-Mar. 4
Windsor, Ont.	Automobile Show	Feb. 27-Mar. 4
Bay City, Mich.	Michigan Automotive Trade Assn.	Feb. 28-Mar. 4
Wichita, Kan.	Wichita Motor Trade Assn.	Feb. 28-Mar. 4
Harrisburg, Pa.	Automobile Show	Mar.—
Ardmore, Okla.	Ardmore Automobile Dealers' Assn.	March
Galesburg, Ill.	Galesburg Automobile Dealers' Assn.	March
Madison, Wis.	Four Lakes Bldg	March
San Antonio	Automobile Trades Assn.	March
St. Louis	Manufacturers' and Dealers' Assn.	March
Brooklyn	Eleventh Annual Show	Mar. 4-11
Saginaw, Mich.	Michigan Automotive Trade Assn.	Mar. 6-10
Indianapolis	Annual Automobile Show	Mar. 6-11
Nashville	Nashville Automobile Trades Assn.	Mar. 6-11
Yonkers, N. Y.	Automobile Show	Mar. 6-11
Wilmington, Del.	Wilmington Trade Assn.	Mar. 6-13
Amarillo, Tex.	Automobile Show	Mar. 10-11
Denver	Denver Automobile Trade Assn.	Mar. 10-20
Boston	Annual Automobile Show	Mar. 11-18
Newark, N. J.	Newark Automobile Dealers' Assn.	Mar. 11-18
Boston	Automobile Salon	Mar. 13-13
Omaha	Omaha Automobile Trade Assn.	Mar. 13-18
Port Huron, Mich.	Michigan Automotive Trade Assn.	Mar. 15-18
Logansport, Ind.	Automobile Show	Mar. 16-18
Torrington, Conn.	Automobile Show	Mar. 20-25
Ypsilanti, Mich.	Michigan Automotive Trade Assn.	Mar. 21-22
Ann Arbor, Mich.	Michigan Automotive Trade Assn.	Mar. 24-25
Jacksonville, Ill.	Automobile Show	Mar. 27
Oklahoma City	Automobile Show	Mar. 27-Apr. 1
Ben. Harb., Mich.	Michigan Automotive Trade Assn.	Mar. 28-31
Quincy, Ill.	Automobile Show	Mar. 28-Apr. 1
Washington, D. C.	Automotive Trade Assn.	Mar. 29-Apr. 1
Bat. Creek, Mich.	Michigan Automotive Trade Ass.	April 2- 8
Buffalo, N. Y.	Automobile Show	Apr. 10-15
Hartford, Conn.	Automobile Show	Sept. 4- 9

FOREIGN SHOWS

London, England	Automobile Show	Feb. 6-11
Santiago, Cuba	Annual Automobile Show	March, 1922
Rio de Janeiro	Automotive Exhibition	Sept., 1922

CONVENTIONS

Wichita, Kans.	Threshermen's Convention	Feb. 21-24

WASHINGTON STATE CONVENTION

Seattle, Jan. 27—All branches of the automotive industry will be brought together for the first time at the 1922 state convention of the Washington Automotive Trade Assn. to be held in Olympia in midsummer. Preliminary plans for the convention indicate that it will mark a big epoch in the history of the industry in the state, according to William A. Simonds, state secretary.

BRIDGEPORT SHOW WEEK

Bridgeport, Conn., Jan. 27—Automobile show week was observed here last week by the Bridgeport Automotive Assn. The show was held in the individual showrooms of the association members.

OAKLAND RESUMES PRODUCTION

Detroit, Jan. 27—Oakland Motor Car Co. division of General Motors Corp. resumed operations today after a month's closing for inventory and re-equipment of the factory to manufacture its new models. Business resulting from the New York and Buffalo shows, as well as sales in other sections, has been heavy and the factory will operate on a schedule which will produce 3800 cars in February.

CARRIGAN FACTORY SOLD

Brattleboro, Vt., Jan. 28—Extent to which the horse-drawn vehicle is giving way to the motor in New England has perhaps been no more sharply emphasized here than announcement this week that the historic carriage factory of Rockwell & Sherwin, for more than 40 years a leader in this line, has been leased to the Roberts Auto Co.

OTTAWA DISPLAY WEEK

Ottawa, Ont., Jan. 27—The automotive section of the Ottawa Retail Merchants' Assn. held a special display week during the national winter carnival running in Ottawa from Jan. 28 till Feb. 4.

SPEEDWAY SEAT SALE

Indianapolis, Jan. 28—The sale of seats for the Indianapolis speedway races to be held Decoration Day will open Jan. 30. It is expected that the rush for choice seats will be greater this year than ever before.

TOLEDO SHOW BEST EVER

Toledo, Jan. 27—The fourteenth annual automobile show at Toledo at the midweek mark had topped last year's attendance record by more than 2,000 each night and appeared to be creating enough interest in motors to carry the dealers through a fine year in 1922.

SEDANS MORE POPULAR

Syracuse, Jan. 28—Forty-three per cent of the cars shipped from the factory of the Franklin Automobile Co. during the first 11 months of 1921 were of the sedan type, an increase of 4 per cent over the same period of 1920.